Big Annemessex River Nontidal Wetlands Watershed Management Plan

DECEMBER 21, 1993

PREPARED FOR:

SOMERSET COUNTY
DEPARTMENT OF TECHNICAL AND COMMUNITY SERVICES

PREPARED BY:

GREENHORNE & O'MARA, INC.

BIG ANNEMESSEX RIVER

NONTIDAL WETLANDS WATERSHED

MANAGEMENT PLAN

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PREPARATION OF THIS STUDY WAS FUNDED BY THE COASTAL AND WATERSHED RESOURCES DIVISION, MARYLAND DEPARTMENT OF NATURAL RESOURCES, THROUGH A GRANT PROVIDED BY THE COASTAL ZONE MANAGEMENT ACT OF 1972, AS AMENDED, ADMINISTERED BY THE OFFICE OF OCEAN AND COASTAL RESOURCE MANAGEMENT, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION.

This study was prepared for, and in cooperation with, the Somerset County Department of Technical and Community Services, Ronald D. Adkins, Administrator, Joan S. Kean, Planner

BIG ANNEMESSEX RIVER
NONTIDAL WETLAND WATERSHED MANAGEMENT PLAN

ADDITIONS AND CORRECTIONS

Page 9, lines 5 & 7	A total of 398 wetland-related sites, encompassing 1,167 acres. . .The area of wetlands alone was 1,564 acres.
Page 9	"wet farm fields" are not wetlands but were identified to highlight their potential as mtigation sites.
Page 9, line 9	The nontidal wetlands were classified according to the U.S. Fish and Wildlife Service Classification System (Cowardin) and included four main palustrine classes.
Page 9, para. 2, line 8	Should read "seasonally flooded/saturated (E) sites account for almost the same acreage as do the C regimes."
Page 50	The Manokin Secondary Growth Area should read Upper Fairmount Secondary Growth Area.
Page 53 - Water Quality	Add "water quality monitoring such as that provided through the Chesapeake Bay and Resource Monitoring Division can provide valuable information for assessing which areas may require restoration or water quality improvement."
Table 6	Marian S. W. should read Marion S.W.
Table 7	Minokin should read Manokin

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I. INTRODUCTION

The development of this nontidal wetlands management plan for the Big Annemessex River watershed was accomplished with the intent of adhering to the certification standards of the Water Resources Administration of the Department of Natural Resources. Upon certification the management plan will be the basis of State nontidal wetland permitting decisions and approval of mitigation sites in the watershed. The information contained in the plan will be used in Somerset County's subdivision and site plan review process, and rezoning approvals. If appropriate, the information will be incorporated into the county's comprehensive plan and zoning ordinance.

1.0 LEGISLATIVE BACKGROUND

The Water Resources Administration (WRA) is responsible for administering Maryland's nontidal wetlands program. One component of this program derives from the multistate Chesapeake Bay Agreement of 1987, whereby each state has developed criteria for the identification of areas where wetlands rehabilitation, restoration and creation projects could be undertaken. The agreement also commits each state to protect and preserve remaining nontidal wetlands. In order to accomplish this, the Maryland Nontidal Wetlands Protection Act was passed in 1989. This legislation establishes several mandates for WRA, including a directive to prepare or assist in the preparation of nontidal wetlands watershed management plans. The development of these plans includes mapping and formulation of technical management components which will address protection, cumulative impacts, mitigation, water supply and flood management.

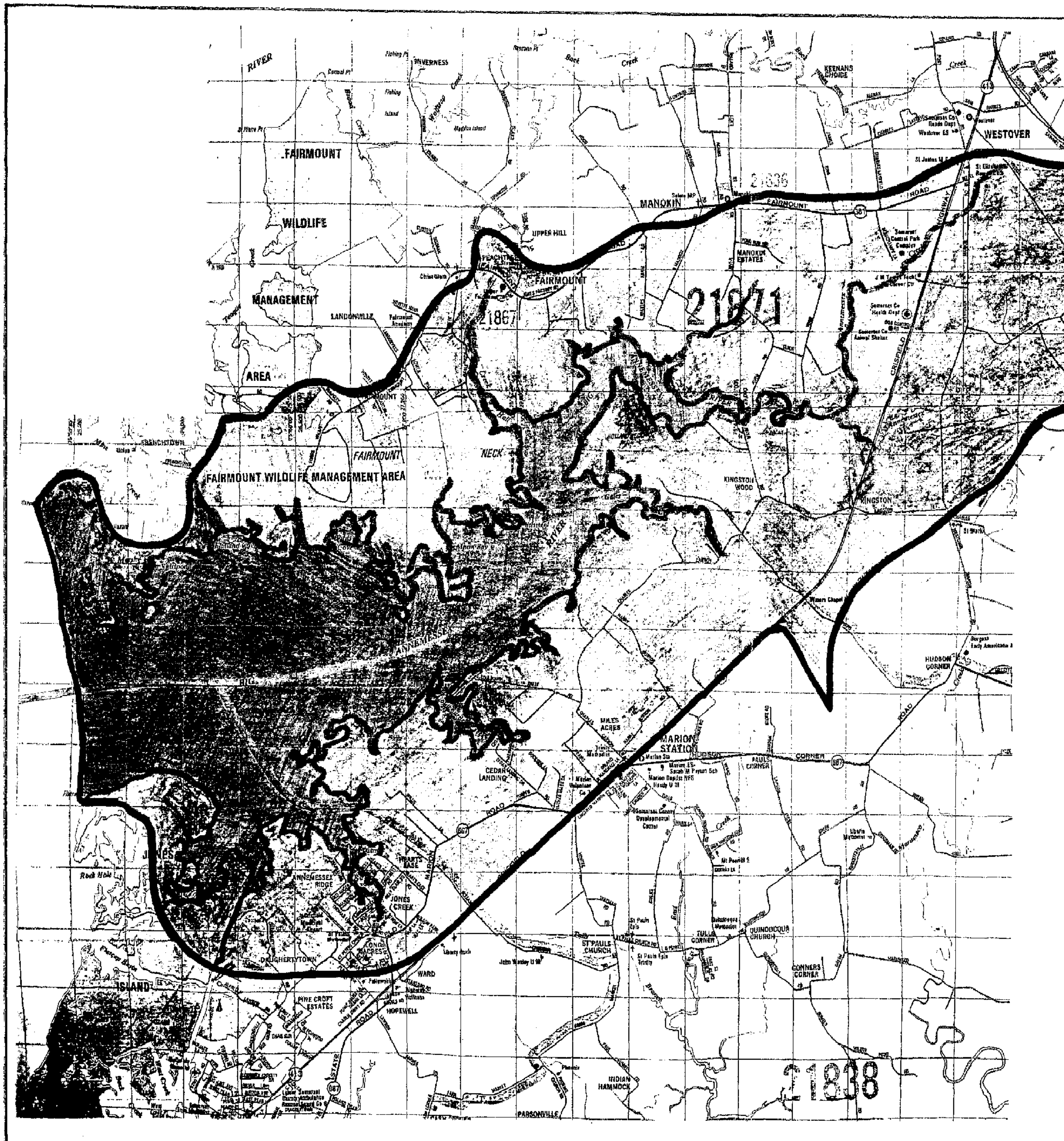
2.0 BASIS FOR SELECTING WATERSHED

The Big Annemessex River watershed was selected from among several watersheds for conducting a prototype management plan study. Figure 1 shows the watershed and regional location. The established criteria and basis for selecting the Big Annemessex River watershed as presented in the Concept Plan prepared by Somerset County, included:

a) Location completely within the County. The Big Annemessex is located off Tangier Sound in the Chesapeake Bay, and to the northeast of the city of Crisfield. It is entirely within Somerset County.

b) Presence of nontidal wetlands. Preliminary research indicated palustrine nontidal wetlands occur throughout the watershed, including forested, shrub-scrub and emergent systems.

c) Moderate development pressures in non-urbanized watershed. The



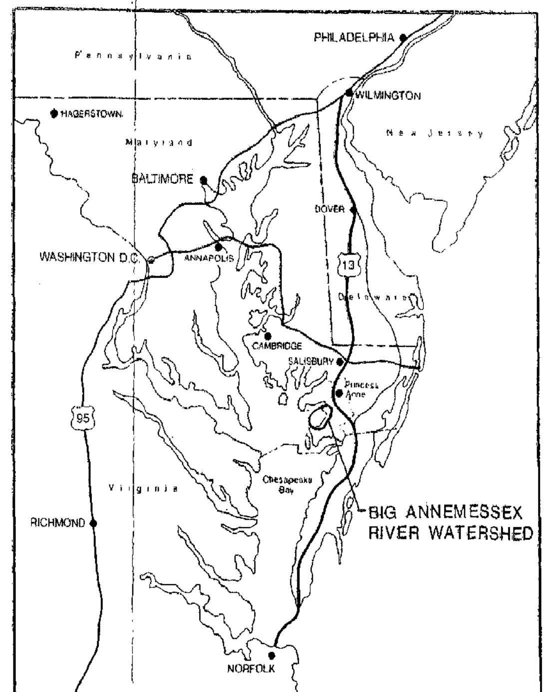


FIGURE 1
PROJECT LOCATION AND WATERSHED BOUNDARY

Big Annemessex River watershed is currently experiencing development pressures, but is mostly rural residential. Designated growth areas include Marion, Westover and northern Crisfield, as well as the Crisfield Airport. Waterfront subdivision has occurred around Jones Creek and Coulbourn Creek.

d) Watershed of manageable size. The size of the watershed is small enough to conduct the investigation without straining financial resources or manpower requirements for obtaining field data.

e) Significant acreage outside the Critical Area expected to experience development. Considerable portions of the watershed are beyond the Chesapeake Bay Critical Area and are subject to development pressures, including the Fairmount area south of Route 361, from MD Rt. 413 to US Rt.13 south of Westover, and areas along Rt. 413.

f) Available mitigation sites. The watershed includes privately owned farmland and timbered parcels, as well as County owned land, which potentially might be suitable for wetland mitigation.

g) Flood prone areas included. A sizeable portion of the watershed is within the 100 year floodplain.

h) Water supply information is available. The County's water supply is drawn from wells, and small impoundments and the intake belt for the Pocomoke aquifer within the watershed contribute to groundwater recharge.

i) DNR approval. A letter concurring with the selection of the Big Annemessex River watershed was received February 26, 1992 from the Watershed Division of WRA, DNR.

II. PROGRAM GOALS

The purpose of developing the watershed management plan for the Big Annemessex River is to protect valuable nontidal wetlands and habitat for threatened and endangered species; to provide a measure of economic and social stability by offering guidance to where development might best occur; to direct mitigation to suitable sites; to address issues of flood management and water supply as applicable and; to protect the water quality of the watershed.

Watershed planning has been recognized as an appropriate vehicle for assessing where and how development should occur. While protecting wetland resources, a watershed management plan can also assist in managing nonpoint source pollution and its effect on water quality in the Chesapeake Bay, its tributaries and groundwater supplies.

The goals of the watershed management plan are:

1. Nontidal Wetlands: Identify nontidal wetland resources, and develop appropriate protection strategies based on a functional assessment;

2. Development: Establish recommendations for development activities related to nontidal wetlands;

3. Mitigation: Identify potential nontidal wetland mitigation sites;

4. Flood Management: Address issues related to flooding within watershed, and develop recommendations;

5. Water Supply: Address issues related to water supply and develop recommendations;

III. RESOURCE ASSESSMENT

1.0 BACKGROUND

This section presents a summary of the efforts with regard to the tasks required for the identification and assessment of the nontidal watershed resources, including:

1). Review of orthophoto wetland delineation maps provided by Maryland DNR, and production of final wetland maps,

2) Functional assessment of the watershed's nontidal wetlands using the New Hampshire and WET methods, as approved by the County and DNR,

3) Rationale and limitations of the methodology used, and

4) Potential mitigation site assessment and mapping.

2.0 PROCEDURES

The approach utilized followed that specified in our proposal dated January 11, 1993. An independent wetland identification investigation was conducted based on photointerpretation using stereo zoom transfer scopes and 1988 color infrared aerial film positives, then compared with that developed by DNR which used the state's MIPS GIS system. About 10-15% differences were noted, including additions or deletions from the state's delineation. The wetland boundaries and identification codes were inked onto acetate and overlayed onto the digital orthophoto quarter quadrangles (USGS 3.75' Series) produced by the Maryland Water Resources Administration (WRA).

Following the photointerpretation effort, field work was conducted 1) to verify signatures, 2) to collect data on pre-selected nontidal wetland sites for the functional assessment, and 3) to evaluate potential wetland mitigation sites.

Analyses were then conducted on the field sampled wetlands and the wetland delineation maps were finalized. Each wetland was allocated an identification number representing its position on a specific quarter quadrangle and within a particular grid of the geo-referencing system displayed on the WRA base maps. For example, the number KNWC31 indicates that this particular site was located in grid C3 of the Kingston Northwest quarter quad, and that it was the first site designated in that grid. The quarter quad abbreviations used were:

KNE: Kingston Northeast
KNW: Kingston Northwest
KSW: Kingston Southwest
MNE: Marion Northeast
MNW: Marion Northwest

MSE: Marion Southeast
MSW: Marion Southwest

The application of the functional assessment methodologies followed, to the extent feasible, suggestions provided by WRA. In this regard, it should be noted, that water quality information specific to the Big Annemessex River watershed and applicable to the New Hampshire Method was not available for this investigation. Several sources were investigated, but either the documents were unavailable or not applicable to the investigation. Consequently, water quality was qualitatively estimated in the field for nontidal wetland sites based on observable conditions within or adjacent to sampled wetland sites, and generalized to nonsampled sites based on this information, other observed conditions in the watershed, and regional water quality data where available.

Urban wetlands as defined by the New Hampshire Method were essentially nonexistent in the Big Annemessex watershed. Hence, the Urban Wildlife Habitat function was not evaluated.

At DNR's direction, questions 2, 5 and 8 were deleted from the general Wildlife Habitat function. For the same reason, the WET methodology was utilized to evaluate the Groundwater Discharge and Production Export functions, while the New Hampshire Method was employed for the **Ecological Integrity, Wildlife Habitat, Finfish (Streams), Finfish (Ponds), Flood Control, Sediment Trapping, and Nutrient Attenuation** functions. Combining these two methodologies in a study of this nature is difficult, since there exists no recognized mechanism for integrating them in order to extrapolate functional values to the watershed level. Also, the deletion of questions from the Wildlife Habitat Function had the effect of minimizing the value of 1) shallow open water within a wetland, 2) emergent wetlands, and 3) upland inclusions. One consequence for this study appears to be a reduction in emphasis for waterbird and other species of emergent-open water mosaic wetland systems. The preference of DNR to delete certain questions was intended not to increase the emphasis on wetlands at the drier end of the wetland spectrum, but rather to eliminate the extra weight DNR felt the New Hampshire Method assigned to open and shallow water areas.

3.0 METHODOLOGY RATIONALE AND LIMITATIONS

The New Hampshire Method is a scoring technique particularly suitable for assessing multiple wetland sites within a watershed. The method ranks a series of wetlands, but one limitation is that wetland science has probably not advanced to where fine distinctions suggested by this method's scores are completely supportable by the scientific literature. The approach of linearly combining the data sheet question results and the calculation of Functional Value Units by multiplying functional values by acreage may not always reflect the nonlinear relationships between wetland processes. However, as discussed in the RESULTS section below, this concern was minimized by utilizing other ranking criteria in addition to acreage. Although the objective of the investigation was to identify relative functional values for all the wetlands in the watershed, partially through sampling of a select number of wetland sites, there may be statistical objections in integrating mathematical operations using the two different methods employed in this investigation, as discussed above.

The numerical values for Groundwater Discharge and Production Export functions were obtained by converting the WET ordinal ratings based on assigning each rating according to the following scheme, which represents the tertiary midpoints on a 1.0 scale:

WET RATING	NUMERICAL SCORE
HIGH	.83
MODERATE	.51
LOW	.17

While the WET methodology allows no mechanism for such a conversion, it was necessary to provide a consistent means for evaluating all the sites for all functions and possibly extrapolating the results to nonsampled nontidal wetlands in the watershed in order to achieve the landscape level objectives of this project. No simple alternative, including the New Hampshire Method, exists for extrapolating wetland functional values beyond the specific sampled wetland to the watershed level. Caution is warranted when making such extrapolations via integration of values across functions, since interactions between functions is poorly understood in wetland science to date. However, if this integration procedure would suggest an association in functionality for certain wetland types or water regimes, for example, it would be useful for providing an index of functionality within the larger watershed for those types or water regimes.

The New Hampshire Method leaves it to the user to define "HIGH", "MODERATE" and "LOW" levels of functioning. This problem was dealt with by calculating functional values on a relative, rather than an absolute, basis. This is discussed in more detail below. Nevertheless, this method provides a cost-effective means for comparing wetland functions at a watershed level, unlike most other approaches.

Most essential functional indicators have been included in the New Hampshire and WET methods. Some estimates such as for the Flood Control function are quantitatively measured by New Hampshire, unlike in WET. The New Hampshire approach is much easier and faster to apply than WET. The WET is not designed to compare different wetland systems, and only predicts the qualitative probability that a function is performed at all, and not its actual value. With New Hampshire, however, some indication of relative level of performance value is afforded. Compared to New Hampshire, WET has low sensitivity to differences between wetlands, since only the grossest level of variance is inherent in the three ranking categories of WET.

While each of the two methods employed in this investigation have limitations, both have the capacity to provide important indicators of wetland functional values, which are otherwise difficult or impossible to obtain within the schedule and budget constraints of this project.

A description of the functional values evaluated in this investigation are listed below:

1. Ecological Integrity- Evaluates the overall health and function of the wetland system, and its stability with regard to present disturbances.

2. Wildlife Habitat- Evaluates the suitability of the wetland as habitat for those animals typically associated with wetlands and wetland edges. No single species is emphasized. Although as specified by DNR, in this application a priority was placed on species which do not require any open water.

3. Finfish Habitat (Stream)- Evaluates the suitability of watercourses for either warm water or cold water fish. No single species was emphasized.

4. Finfish Habitat (Pond)- Same as for stream habitat function, except applies to ponds and lakes.

5. Flood Control- Evaluates the effectiveness of the wetland in storing floodwaters and reducing downstream flood peaks.

6. Sediment Trapping- Evaluates the potential of the wetland to trap sediment in runoff water from surrounding upland.

7. Nutrient Attenuation- Evaluates the potential of the wetland to reduce the impacts of excess nutrients in runoff water on downstream lakes and streams.

8 Groundwater Discharge- Assesses in which wetlands the rate of discharge from groundwater into the wetland exceeds the rate of recharge to underlying groundwater from the wetland on a net annual basis.

9. Production Export- Evaluates the extent to which organic material from the wetland is transported, and thus made available, to downslope ecosystems.

4.0 RESULTS

4.1 WETLAND IDENTIFICATION AND DELINEATION

The results of the photointerpretation analysis and field verification of wetlands were inked onto acetate overlays and registered to the 1 inch = 600 feet maps. One set of maps was prepared for each quarter quad showing the boundary of each wetland identified, along with its identification number, class, subclass and water regime. A summary of wetland types and water regimes is presented in Table 1, and in Figures 2 and 3, and in Appendix Figures 1-4. A total of 398 wetland-related sites, encompassing 1,167 acres, was identified in the 29,842 acre Big Annemessex River watershed, including 294 nontidal wetlands, 85 wet farm fields, and 19 riverine systems. The nontidal wetlands included 4 main palustrine classes: 1) Emergent (PEM), 2) Forested (PFO), 3) Scrub-Shrub (PSS) and 4) Open Water (POW). Combinations of PFO and PSS, as well as PSS and PEM were also identified. Wet farm fields are those sites exhibiting poorly drained conditions where water frequently stands during wet periods, but which are being actively farmed. These sites are not generally considered jurisdictional wetlands, and consequently were not evaluated as to function and value. They may reflect areas which supported previous wetlands prior to commencement of agricultural activities, and in some cases might possibly support future wetlands if farming ceased and the sites were restored. Riverine systems consist of tidal (R1) and nontidal lower perennial (R2) streams, as well as intermittent (R4) channels and tributaries. The PFO wetlands are the most common type in the watershed, occupying over 45 percent of the sites and 69 percent of the acreage. The other classes were fairly evenly distributed, with the combination classes accounting for only a small number and percentage of the total.

The most common water regime identified was Temporarily Flooded (A), which occupies over 61 percent of the total nontidal wetland acreage and 47 percent of the sites. The next most common regime is Seasonally Flooded (C), accounting for 22 percent of the sites and 16 percent of the acreage. Permanently Flooded (H) sites are virtually all ponds and are almost as common as Seasonally Flooded sites, but tend to be small and account for only 5 percent of the acreage. Ponds occupy the POW classification and appear, for the most part, to have been excavated for borrow material. Seasonally Flooded/Saturated (E) sites account for almost the same acreage percentage as do the A regimes, but the E regime sites tend to be larger. Water regimes classified as B (Saturated), F (Semipermanently Flooded) and J (Intermittently Flooded) were comparatively rare in the watershed. Water regimes are sometimes difficult to identify owing to varying hydrological conditions on sites from year to year, as well as during a particular year. Thus, the actual water regime of a particular site may not remain fixed, although the water regime ratios would not be expected to change significantly over short periods of time.

TABLE 1

BIG ANNEMESSEX RIVER WATERSHED
SUMMARY OF WETLAND TYPES AND WATER REGIMES

WETLAND TYPES

*acreage & percentages are rounded and may not equal 100%

WETLAND TYPE	NUMBER SITES	PERCENT NUMBER	ACREAGE	PERCENT ACREAGE
PEM	57	19	147	9
PFO	134	46	1077	69
POW	48	16	81	5
PSS	37	13	145	9
PFO/PSS	4	1	60	4
PSS/PEM	14	5	54	3
TOTALS	294	100	1564	99
Pf	85		103	
R1	7			
R2	2			
R4	10			

WATER REGIMES

*acreage & percentages are rounded and may not equal 100%

WATER REGIME	NUMBER SITES	PERCENT NUMBER	ACREAGE	PERCENT ACREAGE
A	137	47	962	62
B	9	3	22	1
C	66	22	254	16
E	31	11	241	15
F	2	1	2	< 1
H	48	16	71	5
J	1	< 1	12	< 1
TOTALS	294	100	1564	99

FIGURE 2 **BIG ANNEMESSEX RIVER WATERSHED**
SUMMARY OF WETLAND TYPES

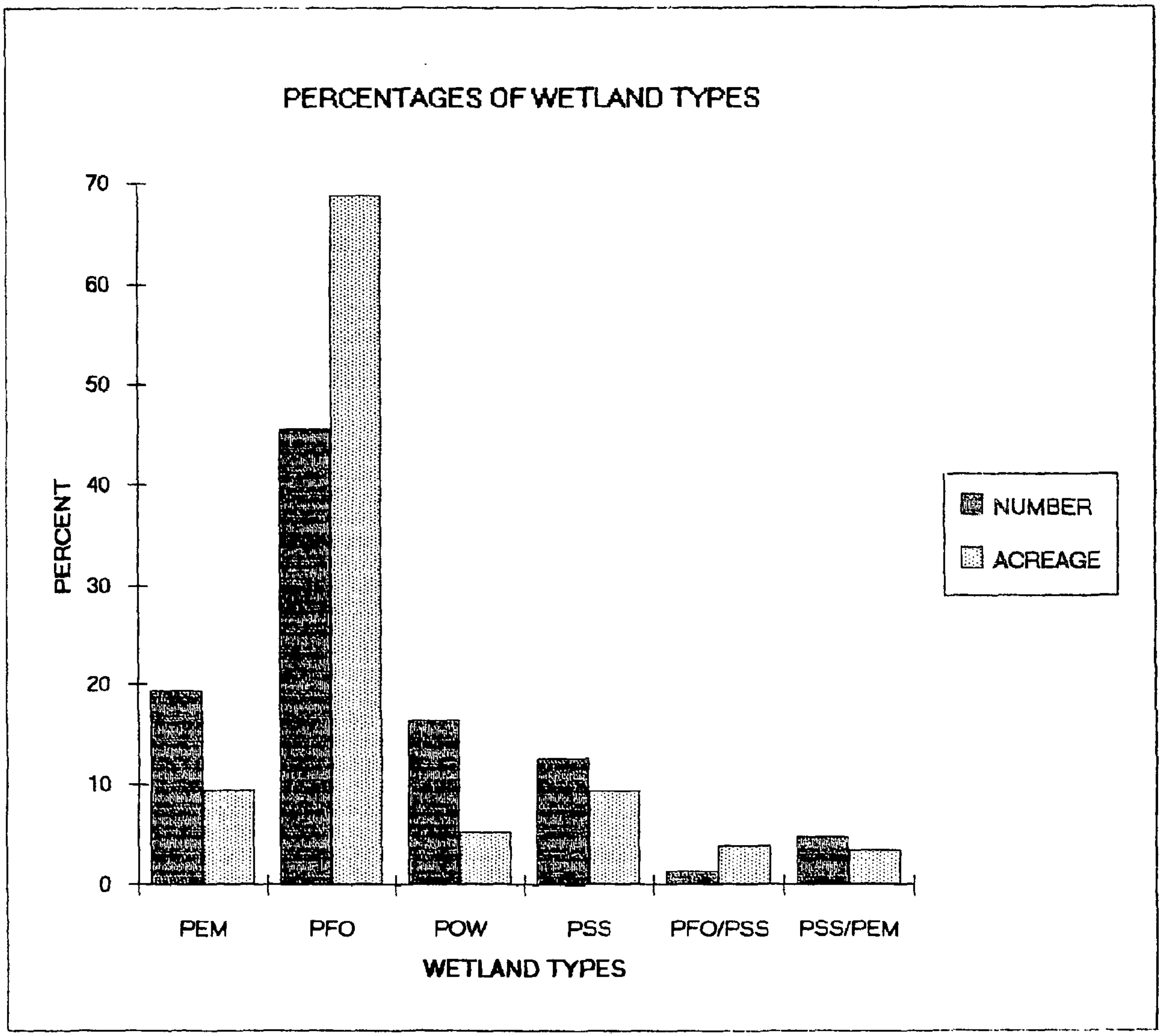
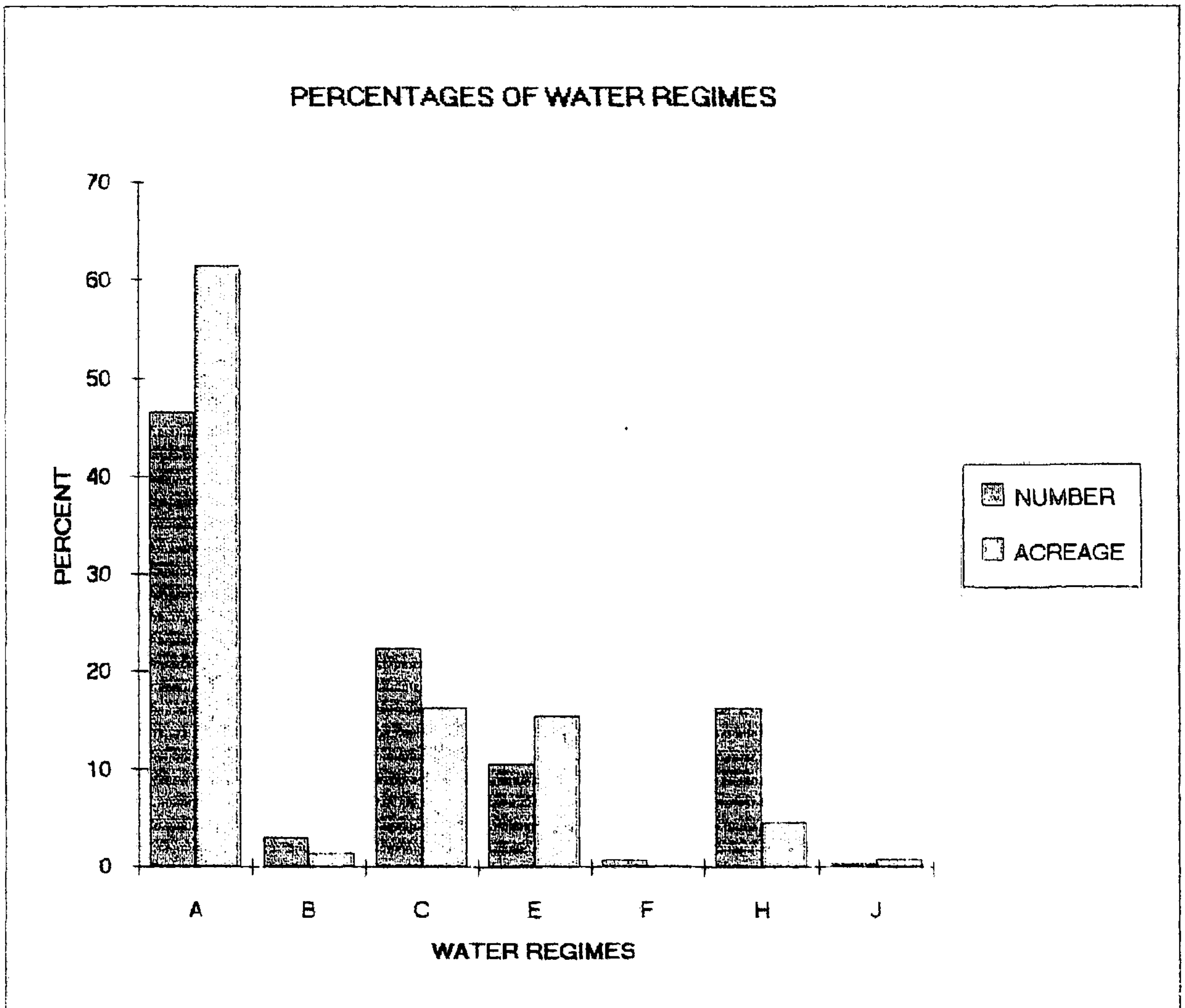


FIGURE 3 BIG ANNEMESSEX RIVER WATERSHED

SUMMARY OF WATER REGIMES



The wetlands in the watershed are underlaid by hydric soils, the most common series including: Fallsington, Johnstown, Othello, Pocomoke and Portsmouth. All of these soil series are listed as hydric soils on the National Hydric Soils List. They are characterized by low chroma and are poorly drained. Standing water is typical during the winter and early spring. Owing to the low relief in the watershed this tendency to pond water combined with a seasonally high water table has resulted in an extensive network of ditches throughout the watershed. Ditching has probably eliminated a significant number of historical nontidal wetlands in the watershed, as evidenced by the widespread occurrence of soils with remnant indicators of hydric conditions.

Vegetation in the nontidal wetland systems of the Big Annemessex River watershed is fairly uniform per wetland type. Palustrine forested sites are dominated by broad-leaved deciduous trees, including red maple, sweetgum, and black gum. The same species predominate in the understory, along with sweet pepperbush, highbush blueberry, spicebush, elderberry, American holly and sometimes sweetbay magnolia. Many recently logged sites have become dominated by loblolly pine, and mixed stands of deciduous trees and loblolly are common. Scrub-Shrub nontidal wetland sites are usually composed of saplings of the PFO listed species, as well as a number of other species, including silky dogwood, multiflora rose, greenbrier, and sometimes bayberry. However, stands dominated by bayberry (Myrica pennsylvanica) are uncommon. Emergent wetlands are characterized by soft rush, umbrella sedge, wool grass, and various other sedges. Phragmites has become established on many sites, and has dominated those sites on which it has gained a foothold.

4.2 FUNCTIONAL VALUE ASSESSMENT

Potential sites were selected based on the photointerpretation effort to conduct field sampling. While 30 sites were initially selected, representing all known nontidal classes, subclasses, water regimes and major sub-watersheds, some adjustments were made where access was infeasible or it was determined from field indicators that the site did not qualify as a wetland. Field data was collected and functional value assessments were ultimately conducted for 38 wetlands, including 5 ponds and 6 streams. The additional sites included 13 PFO, 7 PEM, 5 PSS, 2 PSS/PEM mixed classes. Vegetation classes 1 (broad-leaved deciduous), 4 (needle-leaved evergreen), and combinations were evaluated for PFO and PSS sites. All water regimes were represented in each major wetland class. Figures A1-A4 (Appendix) shows the functional value results.

4.2.1 FUNCTIONAL VALUE INDICES (FVI)

A summary of Functional Value Indices (FVI's) for the sampled nontidal wetland sites is shown in Table 2. The table presents each site by its mapping identification number (**Wetland No.**), class (Type), water regime (**WR**), Acres, and functional values for the following functions: Ecological Integrity (**EI**), Wildlife Habitat (**WH**), Finfish Habitat for streams (**FS**), Finfish Habitat for ponds (**FP**), Flood Control (**FC**), Sediment Trapping (**ST**), Nutrient Attenuation (**NA**), Groundwater Discharge (**GWD**), and Production Export

TABLE 2 BIG ANNEMESSEX RIVER WATERSHED

FUNCTIONAL VALUES OF SAMPLED WETLANDS

Wetland No.	Type	WR	Acres	EI	WH	FS	FP	FC	ST	NA	GWD	PE	Top Val.
KNEA22	PSS1	A	13.8	1	0.72			0	0.44	0.41	0.17	0.17	1
KNEB11	PFO1	C	2.59	0.9	0.39			0	0.08	0.09	0.17	0.17	
KNWA41	PSS1	A	18.38	0.8	0.65			0	0.26	0.37	0.17	0.17	
KNWB21	PFO1	A	91.3	1	0.47			0	0.16	0.34	0.17	0.17	1
KNWB41	PEM1	E	1.4	0.7	0.49			0	0.12	0.36	0.17	0.5	1
KNWB51	PSS/EM	C	2.02	1	[illegible]			0	0.08	0.09	0.17	0.17	2
KNWC11	PSS1	B	0.7	0.6	[illegible]			0.2	0.38	1	0.5	0.5	4
KNWC21	PFO1/4	A	15.5	0.7	0.67			0	0.28	0.45	0.17	0.17	
KNWC22	PFO1	F	1.15	0.9	0.59			0	0.12	0.41	0.17	0.17	
KNWC31	PEM1	E	0.6	0.9	0.65			0	0.38	0.47	0.17	0.17	
KNWC32	PFO1/4	C	1.84	0.9	0.86			0	0.42	0.5	0.17	0.5	2
KNWC33	PEM1	E	2.5	0.1	0.64			0	0.08	0.32	0.17	0.17	
KNWC34	POW	H	1.38	1	0.79		0.6	0	0.42	0.51	0.17	0.5	4
KNWC38	PEM1	C	0.8	0.7	0.7			0	0.08	0.32	0.17	0.17	
KSWA11	PFO1/4	C	3.4	1	0.59			0	0.34	0.38	0.17	0.17	1
MNEA31	PFO4/1	E	26.22	0.9	0.72			0	0.08	0.32	0.17	0.17	
MNEA33	PFO4	A	8.05	0.7	0.63			0	0.08	0.38	0.17	0.17	
MNEA34	PEM1	C	1.38	0.6	0.54			0	0.12	0.41	0.17	0.17	
MNEC21	PFO1/4	A	11.27	1	0.67			0	0.08	0.5	0.17	0.17	1
MNED41	PFO1	A	20.7	0.9	0.66			0	0.08	0.5	0.17	0.17	
MNWD31	PSS1	B	2.07	0.9	0.58			0	0.1	0.4	0.17	0.17	
MNWD32	PEM1	E	1.15	0.7	0.63			0	0.14	0.21	0.17	0.17	
MNWD41	PFO1	C	2.53	0.8	0.62			0	0.08	0.32	0.17	0.17	
MSEA41	PFO1	A	7.6	0.9	0.53			0	0.08	0.5	0.17	0.17	
MSEA42	PSS1	B	2.76	1	0.6			0	0.08	0.5	0.17	0.17	1
MSEA43	PSS/EM	B	13.34	0.9	0.7			0	0.08	0.32	0.17	0.17	
MSEA44	POW	H	8.51	0.9	0.51		0.6	0	0.26	0.37	0.17	0.17	1
MSEB26	PEM1	B	0.25	1	0.91			0	0.08	0.37	0.17	0.17	2
MSEB41	POW	H	3	0.8	0.83		0.6	0.9	0.6	0.61	0.17	0.5	5
MSEC21	PFO1	E	94.07	1	0.8			0	0.08	0.5	0.17	0.17	2
MSEC22	POW	H	2.88	1	0.59		0.6	0	0.08	0.55	0.17	0.17	2
MSED21	POW	H	2.65	1	0.85		0.8	0	0.2	0.35	0.17	0.17	3
KNWC23	RIV	1				0.5							
KNWC35	RIV	1				0.9							1
KNWC14	RIV	1				0.6							
MSEB21	RIV	1				0.7							
KNWC23	RIV	1				0.5							
KNEA22	RIV	4				0.6							
AVG. ALL SITES			11.43	0.85	0.66	0.63	0.64	0.03	0.19	0.41	0.18	0.22	
STDS FOR ALL SITES			22.34	0.19	0.12	0.15	0.09	0.16	0.15	0.16	0.06	0.12	
SITE RATINGS BASED ON RELATIVE FUNCTIONAL VALUES:													
	Top 20% of values				Middle Values				Lower 20% of values				

(**PE**). All but the last two functions were assessed using the New Hampshire Method. Groundwater Discharge and Production Export were evaluated using the WET methodology.

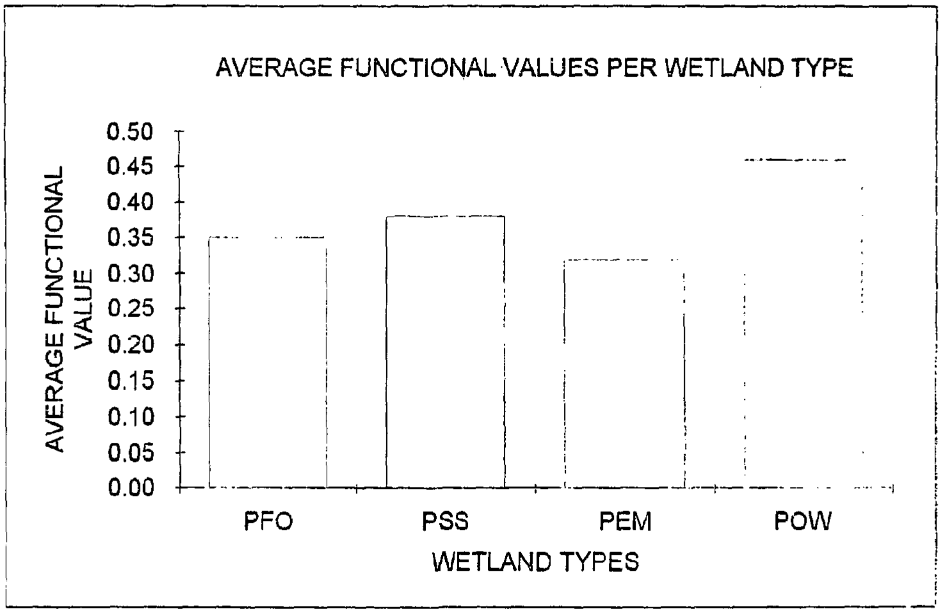
As demonstrated in Figure 4, no clear association between nontidal wetland types or water regimes was discernable in the Big Annemessex River watershed. Consequently, no generalizations of functional values could reasonably be assigned from the sampled sites to nonsampled ones. Such associations may possibly exist, but the WET and New Hampshire functional methodologies may lack the requisite sensitivity to detect them.

Table 2 does suggest, however, that some functions seem to be performed to a greater extent by most nontidal wetlands in the watershed than other functions. This situation is evident in Figure 5, where functional values averaged over all sampled wetlands are much higher for Ecological Integrity and the habitat functions (Wildlife, Finfish-Stream, and Finfish-Pond) than for the remaining functions. It appears that the Flood Control, Sediment Trapping, Groundwater Discharge and Production Export functions are poorly performed by most wetlands in this watershed, and Nutrient Attenuation only to a moderate degree.

For comparing values among different wetlands for any particular function, values were rated on a relative basis. That is, the highest values observed for a specific function were the standard by which all others were evaluated for that function. As an example, in Table 2 the highest value for Wildlife Habitat was calculated for wetland MSEB26 at .91. By dividing that value and all others for that function by the highest value, ie. .91, the values were ranked from highest to lowest. Converted values between 1.0 to .8 were considered of highest (top) rank. For Wildlife Habitat, this included raw (unconverted) values between .73 and .91. Unconverted values between .21 and .73 were considered middle values, and those less than .21 were ranked lowest. In using this approach a relative ranking of values was attained for each function independent of other functions. So that, while a function such as Nutrient Attenuation, for example, might be performed only to a limited extent within the watershed the sites of highest performance nonetheless could be identified. An exception was made for Ecological Integrity, since nearly all values would have ranked in the top level. This indicates, as previously stated, that this function is an important one throughout the watershed. However, a more discriminating approach was necessary to differentiate relative levels of performance for this function.

For the function of Ecological Integrity, values of .95 and above were considered Top Values, those below .35 Low, and those in between were Middle Values. The number of Top Values was summed for each site sampled. Figure 6 shows the values for Ecological Integrity. As previously stated, no obvious pattern is evident with regard to wetland types. This was also true for the other functions presented in Figures 7 through 11. Charts for Flood Control, Groundwater Discharge and Production Export are not presented, since all values for each were similar and of low magnitude.

FIGURE 4 BIG ANNEMESSEX RIVER WATERSHED



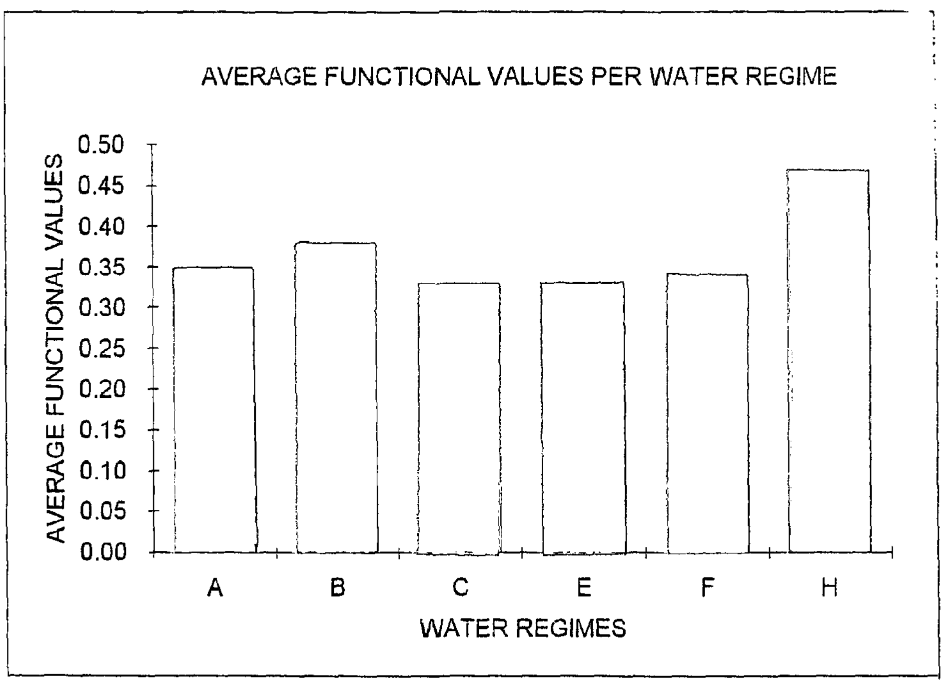
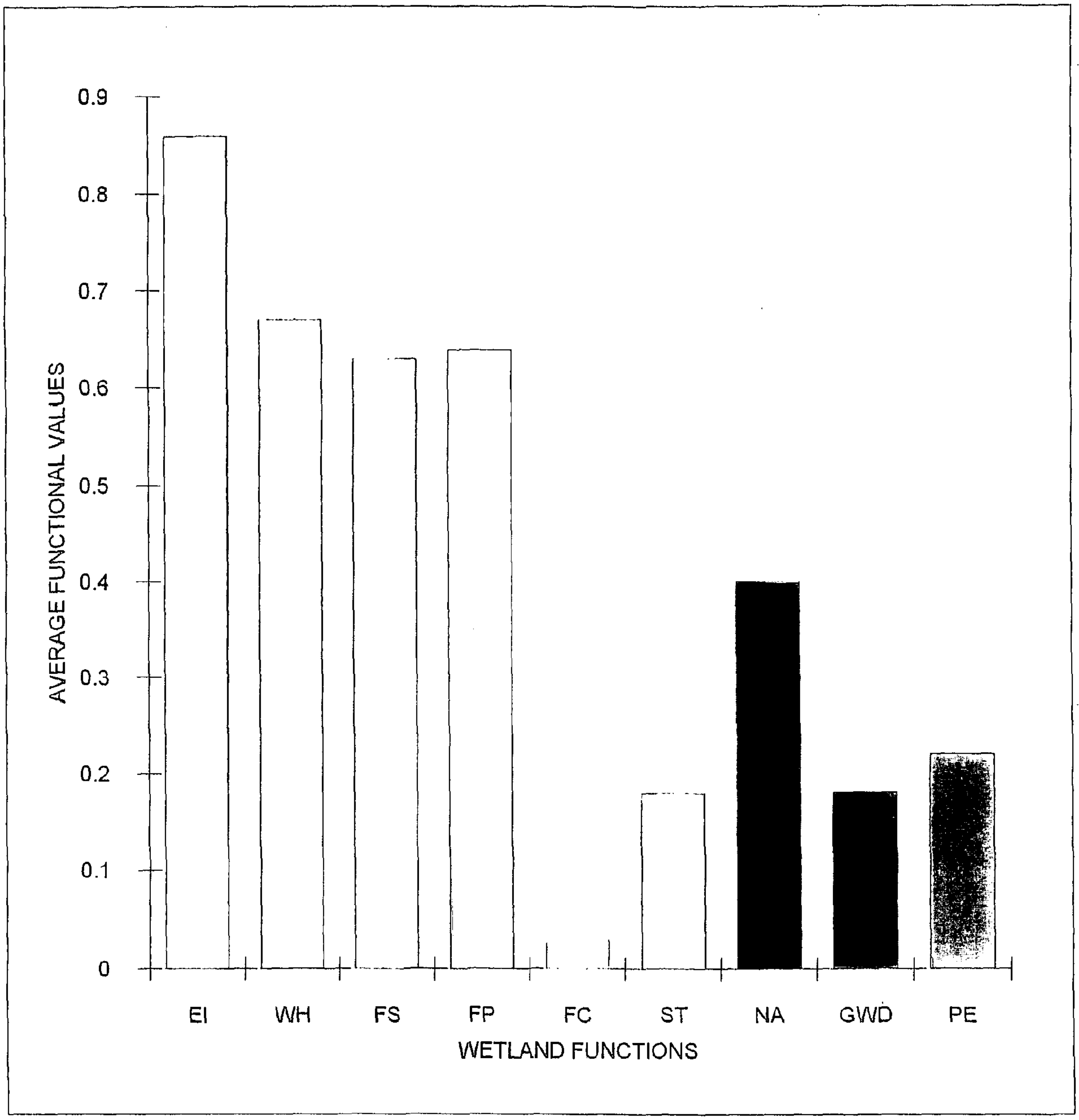


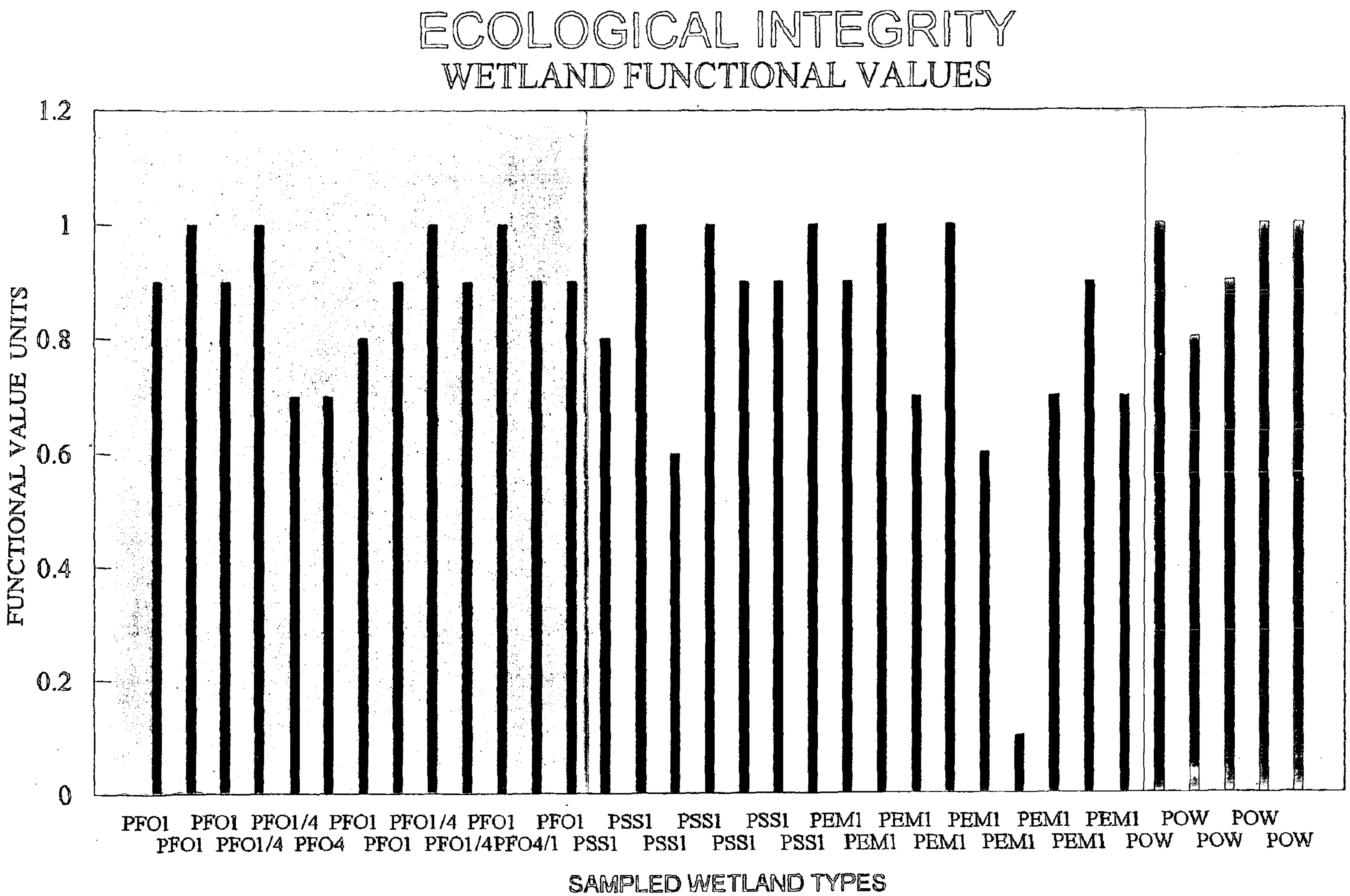
FIGURE 5

BIG ANNEMESSEX RIVER WATERSHED
FUNCTIONAL VALUES OF SAMPLED WETLANDS



EI: Ecological Integrity
WH: Wildlife Habitat
FS: Finfish Habitat (Streams)
FP: Finfish Habitat (Ponds)
FC: Flood Control
ST: Sediment Trapping
NA: Nutrient Attenuation
GWD: Groundwater Discharge
PE: Production Export

FIGURE 6



ECOLOGICAL INTEGRITY
WETLAND FUNCTIONAL VALUES
FUNCTIONAL VALUE UNITS
1.2
1
0.8
0.6
0.4
0.2
0
PFO1 PFO1 PFO1/4 PFO1 PFO1/4 PFO1 PFO1 PSS1 PSS1 PSS1 PEM1 PEM1 PEM1 PEM1 PEM1 POW POW
PFO1 PFO1/4 PFO4 PFO1 PFO1/4PFO4/1 PSS1 PSS1 PSS1 PSS1 PEM1 PEM1 PEM1 PEM1 POW POW POW
SAMPLED WETLAND TYPES

FIGURE 7

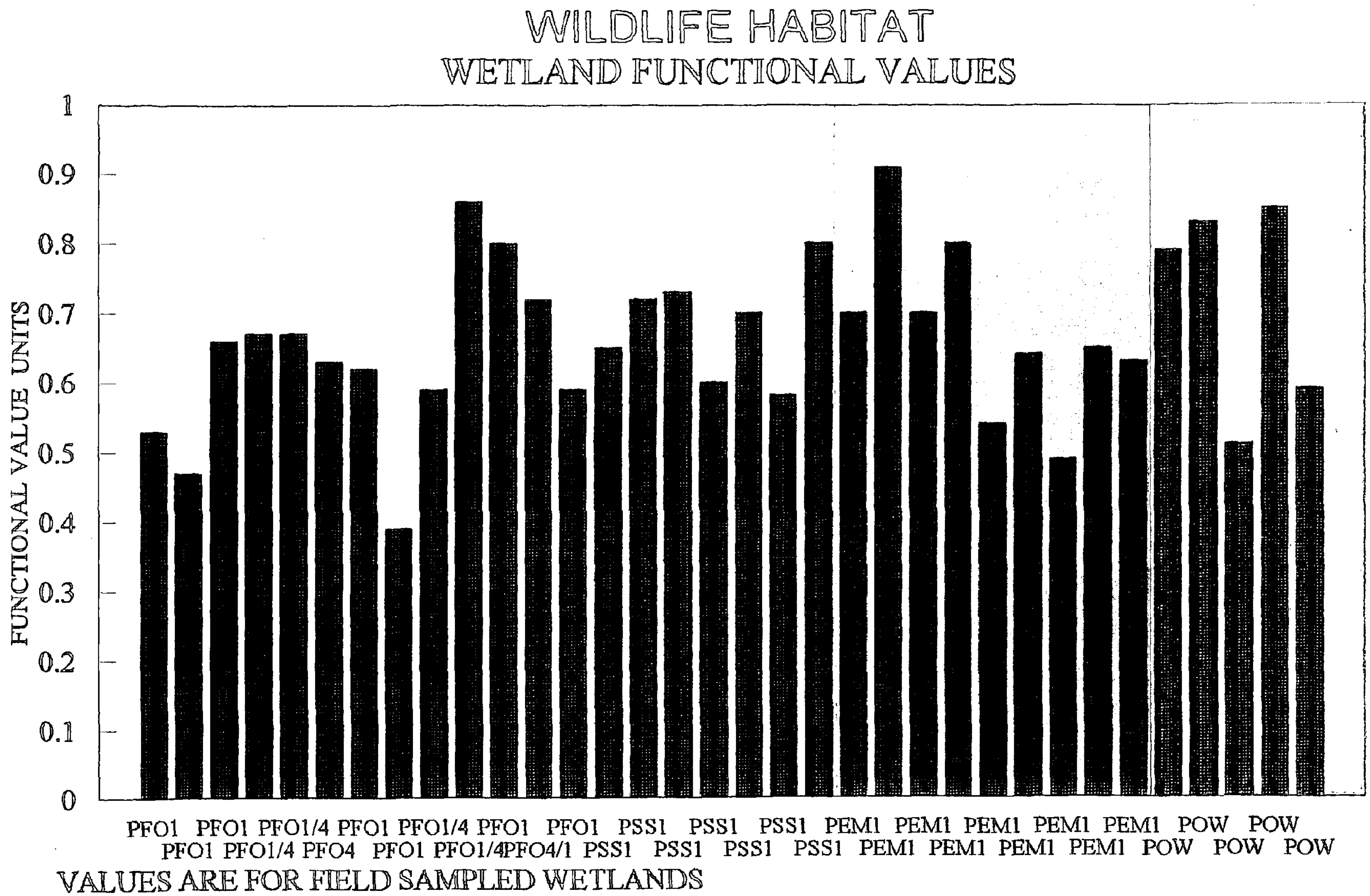
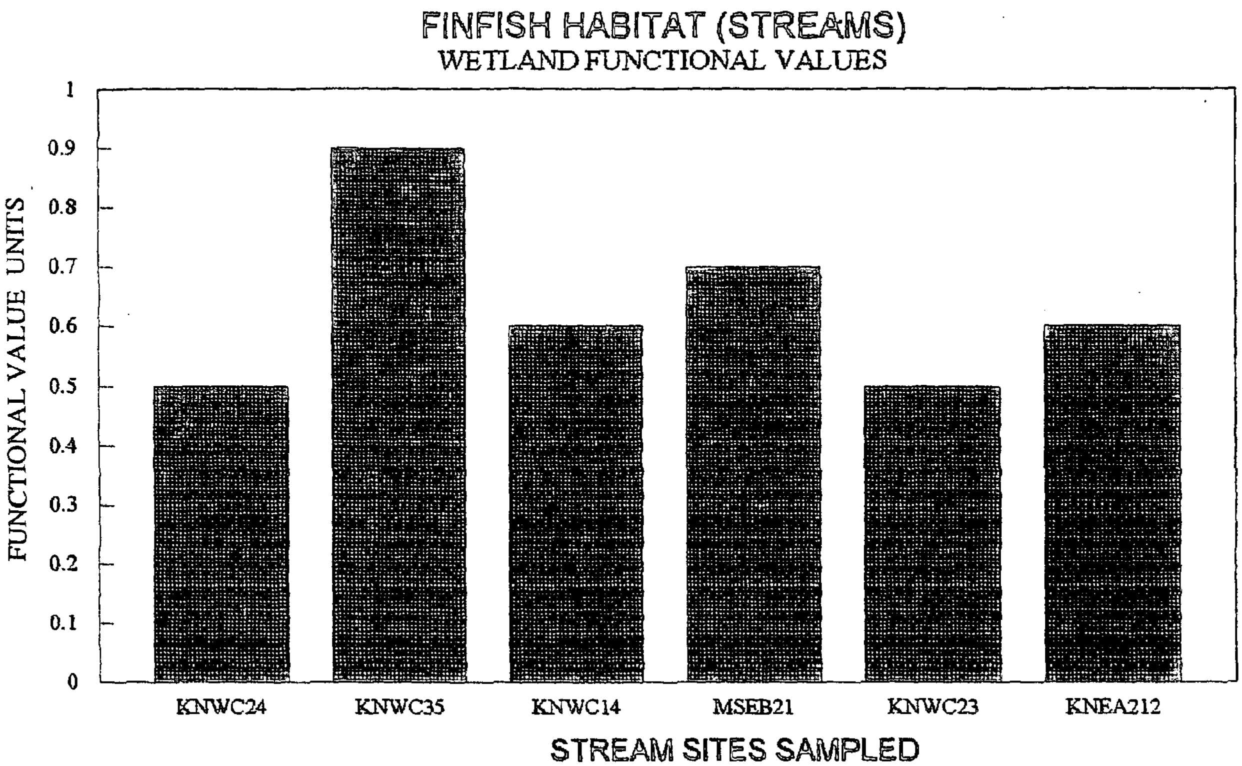

WILDLIFE HABITAT
WETLAND FUNCTIONAL VALUES
FUNCTIONAL VALUE UNITS
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
PFO1 PFO1 PFO1/4 PFO1 PFO1/4 PFO1 PFO1 PSS1 PSS1 PSS1 PEM1 PEM1 PEM1 PEM1 PEM1 POW POW
PFO1 PFO1/4 PFO4 PFO1 PFO1/4PFO4/1 PSS1 PSS1 PSS1 PSS1 PEM1 PEM1 PEM1 PEM1 POW POW POW
VALUES ARE FOR FIELD SAMPLED WETLANDS

FIGURE 8



FINFISH HABITAT (STREAMS)
WETLAND FUNCTIONAL VALUES
FUNCTIONAL VALUE UNITS
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
KNWC24
KNWC35
KNWC14
MSEB21
KNWC23
KNEA212
STREAM SITES SAMPLED

FIGURE 9

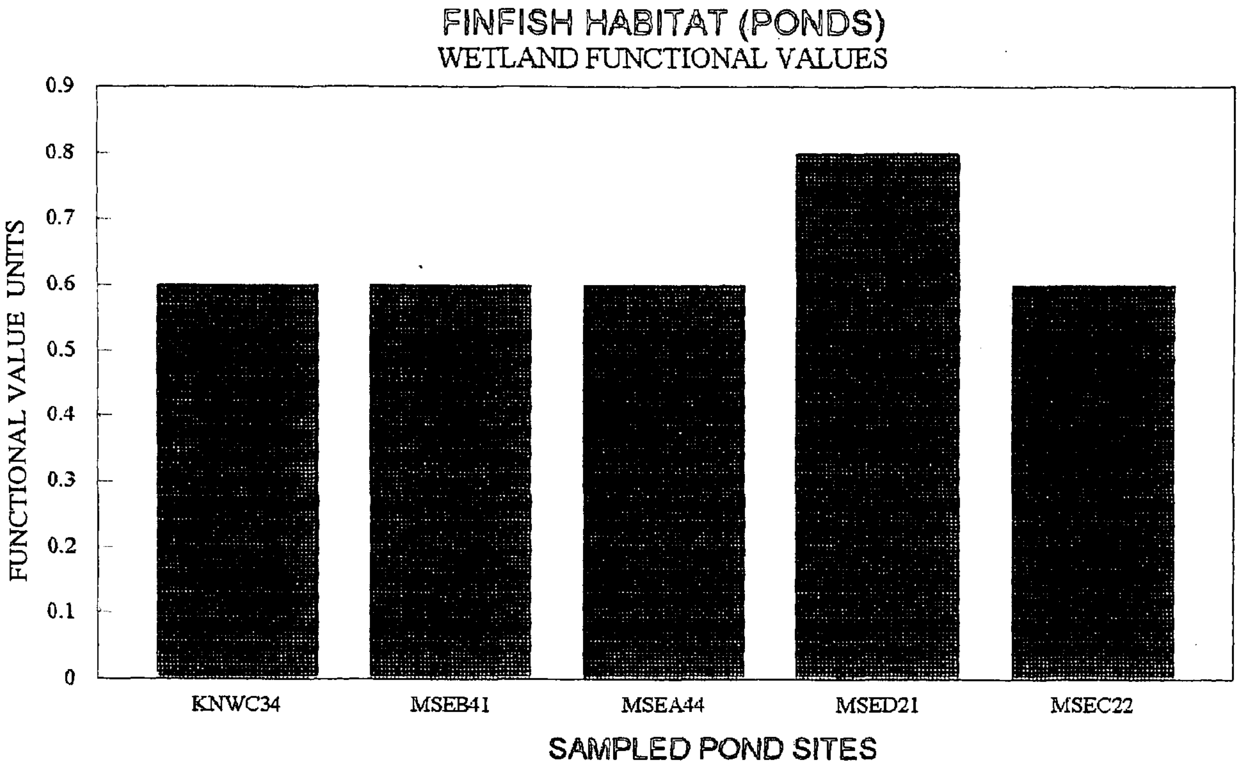

FINFISH HABITAT (PONDS)
WETLAND FUNCTIONAL VALUES
FUNCTIONAL VALUE UNITS
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
KNWC34
MSEB41
MSEA44
MSED21
MSEC22
SAMPLED POND SITES

FIGURE 10

SEDIMENT TRAPPING
WETLAND FUNCTIONAL VALUES

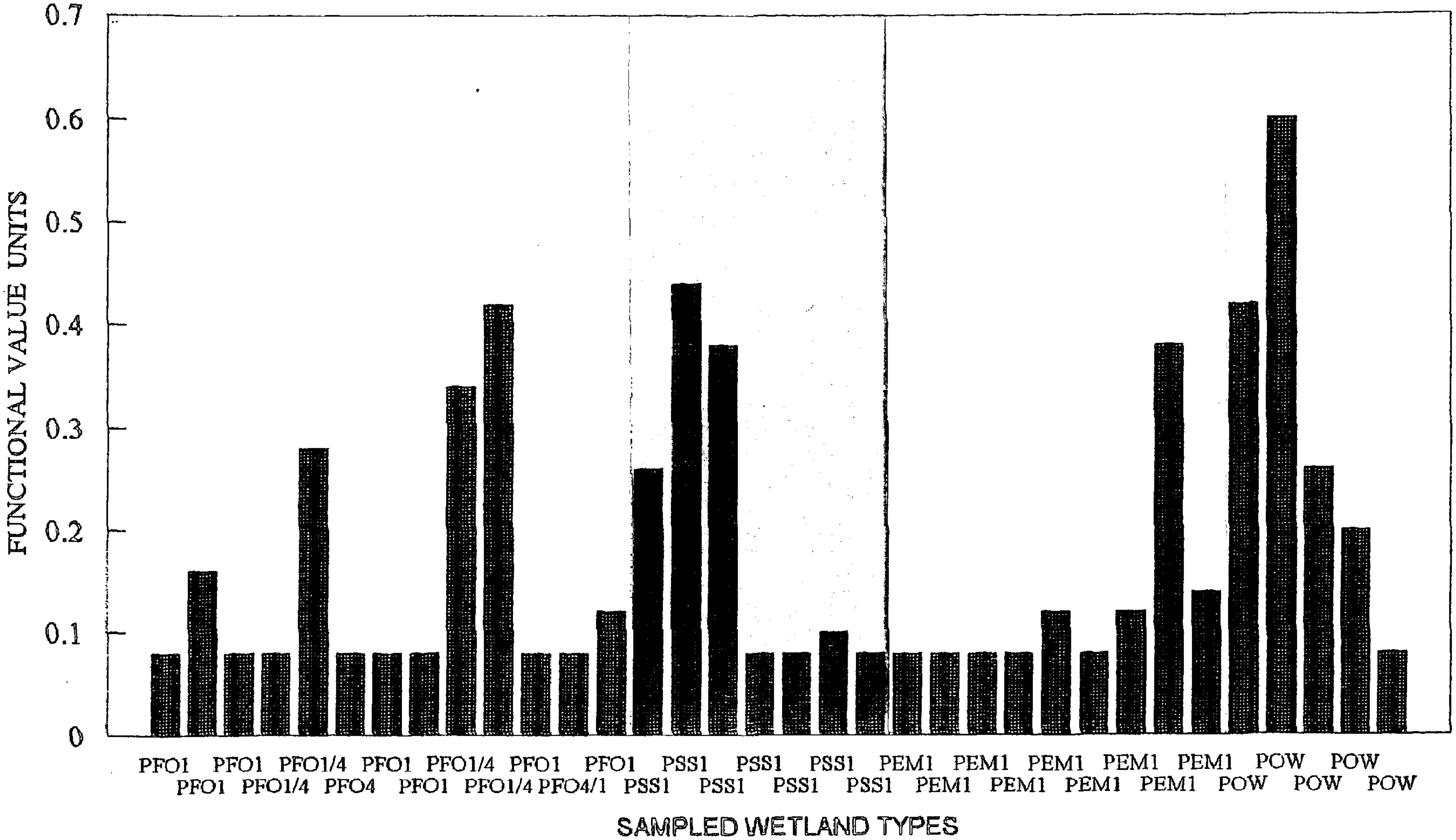
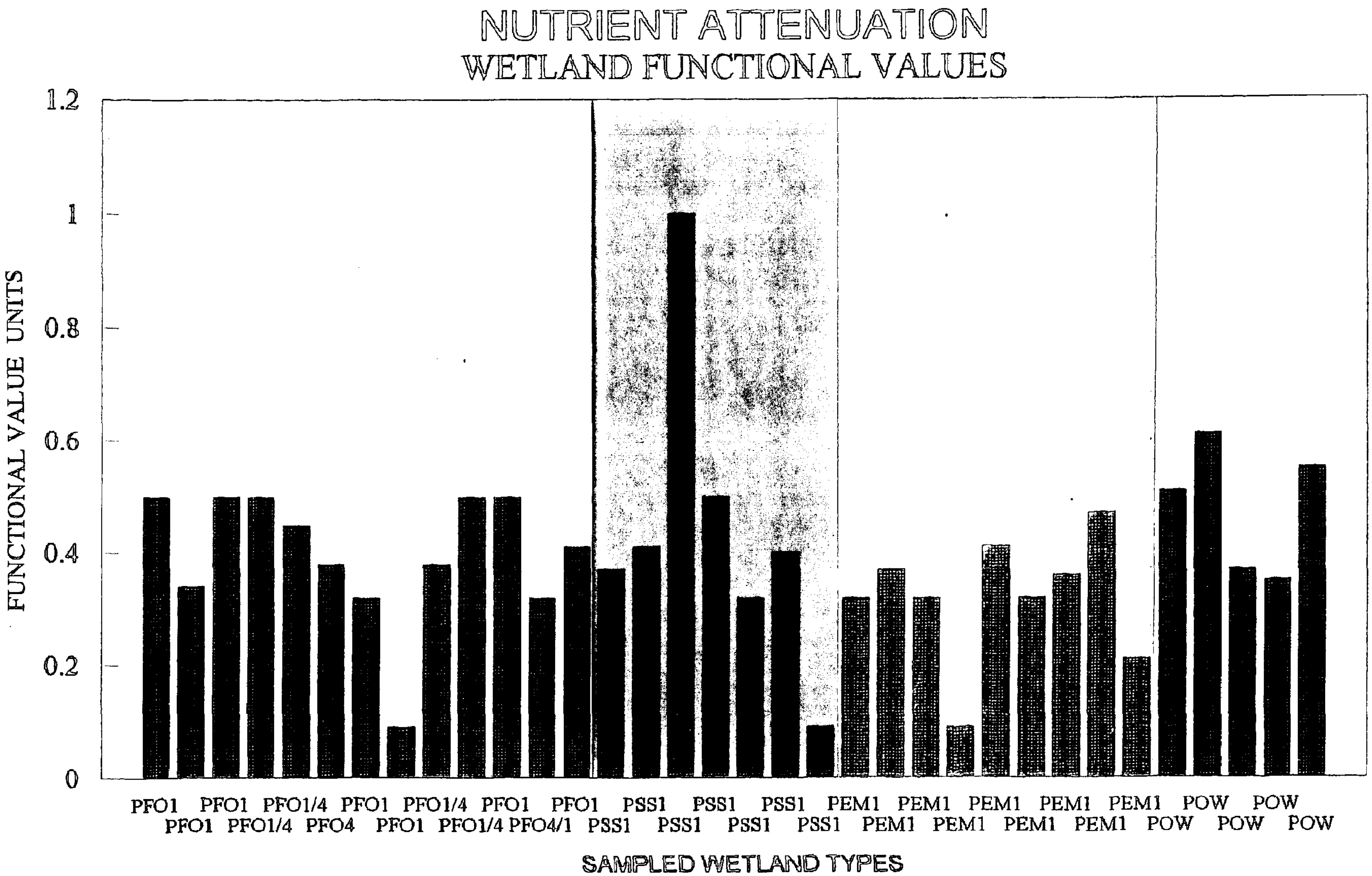


FIGURE 11



NUTRIENT ATTENUATION
WETLAND FUNCTIONAL VALUES
FUNCTIONAL VALUE UNITS
1.2
1
0.8
0.6
0.4
0.2
0
PFO1 PFO1 PFO1/4 PFO1 PFO1/4 PFO1 PFO1 PSS1 PSS1 PSS1 PEM1 PEM1 PEM1 PEM1 PEM1 POW POW
PFO1 PFO1/4 PFO4 PFO1 PFO1/4 PFO4/1 PSS1 PSS1 PSS1 PSS1 PEM1 PEM1 PEM1 PEM1 POW POW POW
SAMPLED WETLAND TYPES

Sites with at least one Top Value from Table 2, other than for Ecological Integrity, were subsequently mapped in the HIGH rank category. Sampled sites with more than one Top Value (excluding Ecological Integrity) were not ranked any higher than those with one Top Value. A Top Value for Ecological Integrity alone was not considered sufficient to qualify for the HIGH rank, because Ecological Integrity was considered less an actual wetland function than a statement of its stability with regard to outside disturbances. Most wetlands in the watershed appear to be relatively stable currently, although many may have been significantly influenced by past disturbances. Wetlands having a low value for Ecological Integrity but ranked in the HIGH mapping category for other reasons, may be particularly in jeopardy with regard to current and future activities and should perhaps be targeted for special treatment during the implementation of the watershed management plan.

4.2.2 WETLAND VALUE UNITS (WVU's)

The use of Top Values (FVI's) from Table 2 allowed identification and mapping of sampled wetlands of significance for the evaluated functions, without regard to their size. Thus, some small wetlands had high values for some functions, but the integration of size would have masked this situation since a premium is placed on sites with large acreage in both the New Hampshire and WET methods. However, in recognition of the general validity of the size concept, acreage values were multiplied by the respective functional values in accordance with New Hampshire method procedures. These results are presented in Table 3 as WETLAND VALUE UNITS (WVU's). Those sites with the largest WVU's for any function are considered to be the strongest performers for that function. When mean functional values across functions are compared with regard to wetland type and water regime (see Figure 12), some differences become apparent, unlike the case where the raw Functional Values without acreage considerations were compared in Figure 4 . The PFO wetland type and the "A" water regime emerge as the dominant systems. This indicates that in the Big Annemessex River watershed the largest wetlands, and hence, the highest performers for most functions, tend to be PFOA wetlands. This makes sense from the perspective that, even if a particular function happens to be performed by both large and small sites to an equivalent, but very low level in the watershed the greatest total quantity of function performance occurs in the largest wetlands, because they have the greatest percentage of land surface where such functioning can occur. From a management standpoint it might make sense to protect the sites where most of the functioning takes place, if a choice must be made in allocating protection measures between sites with equivalent functional values.

The emergence of PFOA wetlands as the dominant functional performers based on WVU scores is a reflection of their proportion in numbers and size within the watershed as previously determined and presented in Table 1. Thus, the largest sampled wetlands had the highest WVU's. This association of size with WVU's was viewed as a basis for assigning relative functional values to sampled as well as **nonsampled** wetlands in the watershed, unlike the case with raw Functional Values. Size alone, therefore, without the necessity of measuring and determining WVU's for every wetland, was incorporated into the rating of wetlands within the watershed. This was accomplished by

TABLE 3

BIG ANNEMESSEX RIVER WATERSHED

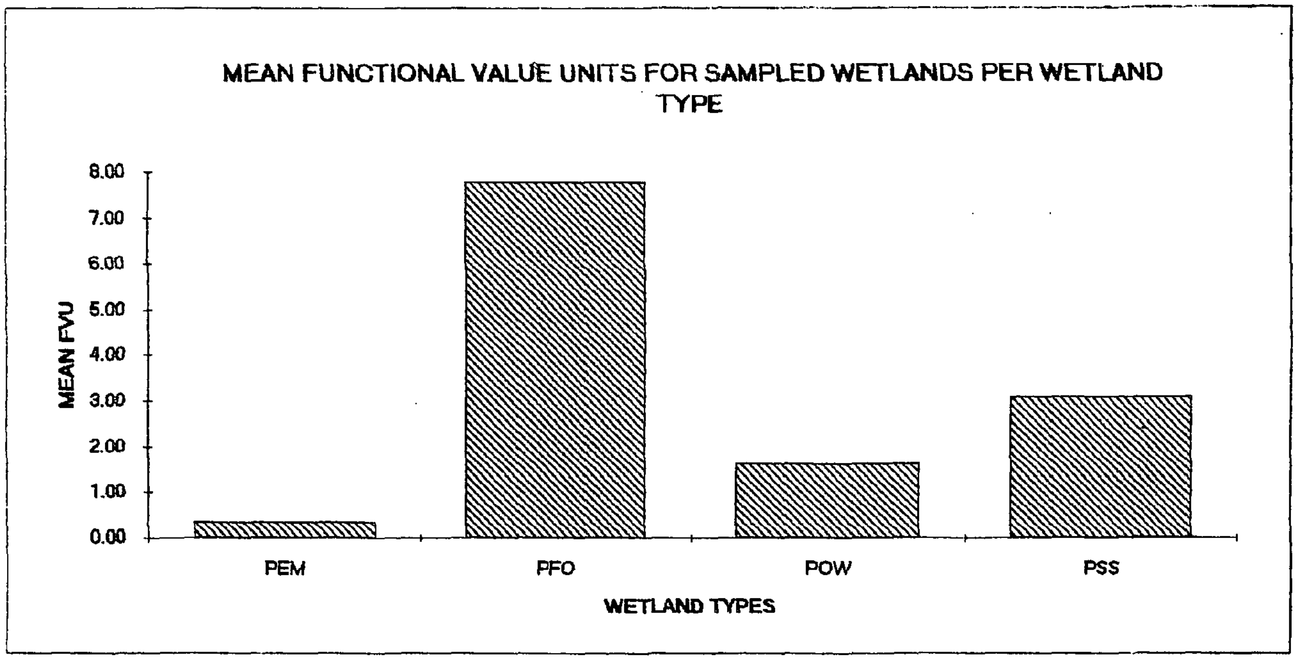
WETLAND FUNCTIONAL VALUE UNITS OF SAMPLED WETLANDS

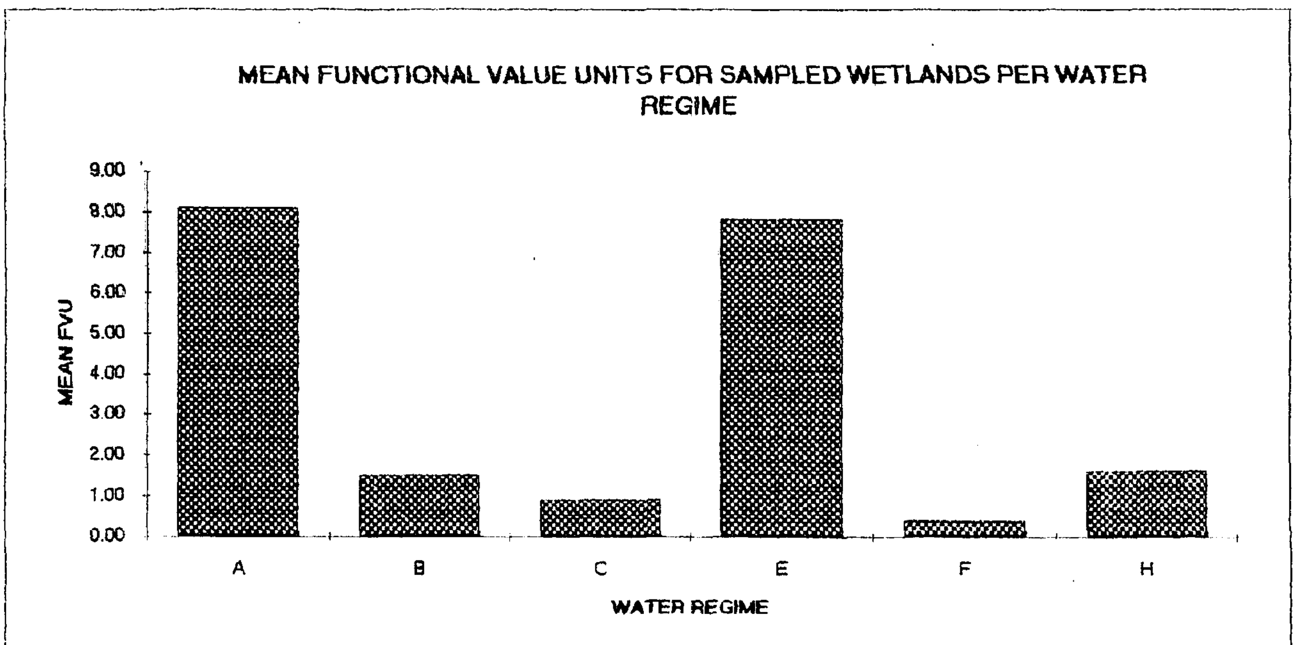
TYPE	WR	NO.	AC	WVU-EI	WVU-WH	WVU-FP	WVU-FC	WVU-ST	WVU-NA	WVU-GWD	WVU-PE	AVG WVU	AVG. WVU/ MAX.WVU
PFO1	E	MSEC21	94.07	94.07	75.26		0.00	7.53	47.04	15.99	15.99	36.55	1.00
PFO1	A	KNWB21	91.30	91.30	42.91		0.00	14.61	31.04	15.52	15.52	30.13	0.82
PFO4/1	E	MNEA31	26.22	23.60	18.88		0.00	2.10	8.39	4.46	4.46	8.84	0.24
PFO1	A	MNED41	20.70	18.63	13.66		0.00	1.66	10.35	3.52	5.32	7.59	0.21
PSS1	A	KNWA41	18.38	14.70	11.95		0.00	4.78	6.80	3.12	3.12	6.35	0.17
PSS1	A	KNEA22	13.80	13.80	9.94		0.00	6.07	5.66	2.35	1.33	5.59	0.15
PFO1/4	A	KNWC21	15.50	10.85	10.39		0.00	4.34	6.98	2.64	2.64	5.40	0.15
PFO1/4	A	MNEC21	11.27	11.27	7.55		0.00	0.90	5.64	1.92	6.06	4.76	0.13
PSSEM	B	MSEA43	13.34	12.01	9.34		0.00	1.07	4.27	2.27	2.27	4.46	0.12
POW	H	MSEA44	8.51	7.66	4.34	5.11	0.00	2.21	3.15	1.45	1.45	3.17	0.09
PFO1	A	MSEA41	7.60	6.84	4.03		0.00	0.61	3.80	1.29	1.29	2.55	0.07
PFO4	A	MNEA33	8.05	5.64	5.07		0.00	0.64	3.06	1.37	1.37	2.45	0.07
POW	H	MSEB41	3.00	2.40	2.49	1.80	2.70	1.80	1.83	0.51	1.50	1.88	0.05
PFO1/4	C	KSWA11	3.40	3.40	2.01		0.00	1.16	1.29	0.58	0.58	1.29	0.04
POW	H	MSED21	2.65	2.65	2.25	2.12	0.00	0.53	0.93	0.45	0.45	1.17	0.03
POW	H	MSEC22	2.88	2.88	1.70	1.73	0.00	0.23	1.58	0.49	0.49	1.14	0.03
PSS1	B	MSEA42	2.76	2.76	1.66		0.00	0.22	1.38	0.47	0.47	0.99	0.03
PFO1/4	C	KNWC32	1.84	1.66	1.58		0.00	0.77	0.92	0.31	0.92	0.88	0.02
PFO1	C	MNWD41	2.53	2.02	1.57		0.00	0.20	0.81	0.43	0.43	0.78	0.02
POW	H	KNWC34	1.38	1.38	1.09	0.83	0.00	0.58	0.70	0.23	0.69	0.69	0.02
PSS/EM	C	KNWB51	2.02	2.02	1.62		0.00	0.16	0.18	0.34	0.34	0.67	0.02
PFO1	C	KNEB11	2.59	2.33	1.01		0.00	0.21	0.23	0.44	0.44	0.67	0.02
PEM1	E	KNWC33	2.50	0.25	1.60		0.00	0.20	0.80	0.43	0.43	0.53	0.01
PEM1	E	KNWB41	1.40	0.98	0.69		0.00	0.17	0.50	0.24	0.70	0.47	0.01
PEM1	C	MNEA34	1.38	0.83	0.75		0.00	0.17	0.57	0.23	0.23	0.40	0.01
PSS1	B	KNWC11	0.70	0.42	0.51		0.14	0.27	0.70	0.35	0.35	0.39	0.01
PFO1	F	KNWC22	1.15	1.04	0.68		0.00	0.14	0.47	0.20	0.20	0.39	0.01
PEM1	E	MNWD32	1.15	0.81	0.72		0.00	0.16	0.24	0.20	0.20	0.33	0.01
PEM1	C	KNWC38	0.80	0.56	0.56		0.00	0.06	0.26	0.14	0.14	0.25	0.01
PEM1	E	KNWC31	0.60	0.54	0.39		0.00	0.23	0.28	0.10	0.10	0.23	0.01
PEM1	B	MSEB26	0.25	0.25	0.23		0.00	0.02	0.09	0.04	0.04	0.10	0.00

FIGURE 12

BIG ANNEMESSEX RIVER WATERSHED

WETLAND FUNCTIONAL VALUE UNITS OF SAMPLED WETLANDS





ranking sampled sites from largest to smallest and assigning highest values to those with a size over 20 acres, lowest values to those below 10 acres, and middle values to those with acreages in between. The selection of 20 acres was based on the objective to identify only the very largest sites as high value. Otherwise, when other criteria unrelated to size were applied in rating sites a disproportionate number of sites would have been classified and mapped as HIGH VALUE wetlands. Nineteen sites within the watershed had acreages over 20 acres, 23 were between 10 and 20 acres, and 252 sites had less than 10 acres. Thus, sites (sampled and nonsampled) with the largest acreages were considered to have the highest WVU's, and were mapped accordingly.

4.2.3 OTHER RANKING CRITERIA

In addition to using raw Functional Values and acreage (reflecting WVU's), other criteria were developed for rating relative wetland values in the watershed. These criteria, together with those pertaining to Functional Values and acreage are presented in Table 4. The acreage of each mapped wetland was measured and compiled with its site number, type, water regime, and basis for assigning its functional rating into a database for all wetlands in the watershed. This database information is provided in Table 5. Each wetland was ranked within one of four functional value categories based on the highest rank for which it qualified according to the criteria listed in Table 4, including: TOP, HIGH, MIDDLE or LOW categories. All wetlands were then color coded on the presentation maps according to these ranking categories. Assignment of particular criteria to a rank category was somewhat arbitrary, and reflects assumptions of the investigators as to perceived issues of significance for the watershed, which might not be accurate. Ideally, these issues would be resolved and significance values agreed upon with vested interest groups and agencies during the Phase I, preliminary plan development, prior to commencement of functional value investigations. While some issues were so identified, these investigations were required to proceed without complete definition of issues or their significance. In practice, information in the database and mapped features will allow County planners to modify the criteria as needed as conditions and social factors change during implementation of the final management plan.

Only one historical record of a rare species habitat was found in the watershed. which was reported in the July, 1990 Somerset County Critical Area Survey For Rare, Threatened, and Endangered Species. This report pertained to the Moore's Chapel Roadside site, the State's only occurrence of a rare plant species. However, the site was essentially destroyed in 1987, and the current population status of the plant at this site is unknown. The site is within a drainage ditch along route 413, and although not a jurisdictional wetland, it was mapped nevertheless as site number KNWB51.

A location for a supposed State Champion Sweetbay Magnolia specimen was mapped based on information obtained from Maryland DNR. The wetland site is number MSEC21.

TABLE 4

NONTIDAL WETLANDS CLASSIFICATION RANKS AND FUNCTIONAL VALUE RATING CRITERIA

Each wetland in the watershed was rated according to the following criteria:

TOP RANK CRITERIA

1. Associated with wetland complex characterized by all of the following:

    a. Two or more wetland types, including R1, R2 and tidal, adjacent to or within 100 feet,
    b. Total complex size greater than 20 acres,
    c. Calculated FVI for at least one sampled wetland is within top 20% for one or more functions, excluding Ecological Integrity, and
    d. One or more wetlands with any other HIGH RANK CRITERIA.

HIGH RANK CRITERIA

Any of the following:

1. Historical record of rare or endangered species inhabiting site;
2. Location of State Champion plant specimen;
3. Within County designated Groundwater Protection Area "A";
4. Wetland water regime of infrequent occurrence in watershed;
5. Dominant vegetation class or subclass is of infrequent occurrence in watershed;
6. Associated with wetland complex characterized by:
    a. Two or more wetland types, including R1, R2 and tidal, adjacent to or within 100 feet,
    b. Total complex size at least 10 acres,
    c. At least 2 wetland types are at least 1 acre in size;
7. Size greater than 20 acres;
8. Calculated FVI within top 20% for one or more functions;
9. Is a perennial stream, or is adjacent to, within 100 feet of, or is located at the headwaters of a perennial stream;
10. Associated with an educational program.

TABLE 4 (continued)

MIDDLE RANK CRITERIA

Any of the following:

1. Associated with wetland complex characterized by:
   a. Two or more wetland types, including R1, R2, R4 and tidal, adjacent to or within 100 feet,
   b. Total complex size less than 10 acres,
   c. Each wetland type greater than 1 acre in size;
2. Calculated FVI 21-79% of top FVI for any sampled function, with the exception of Ecological Integrity,
3. Size between 5 and 20 acres.
4. Is an intermittent stream.

LOW RANK CRITERIA

Not matching any other criteria.

The Somerset County Groundwater Protection Report recommends a protection zone for Management Area "A", which includes the two wetlands numbered as KNWD11 and KNWD12.

Regarding wetland water regimes of unusual occurrence, the following were identified:

WATER REGIME	NUMBER OF SITES
B	8
F	1
J	1

Seven wetlands were mapped having an infrequent vegetation class, namely broad-leaved evergreen (Myrica pennsylvanica).

The trail system within the wooded wetlands associated with the vocational technical school along route 413 was considered to have high social significance, even though education functions were not specifically evaluated in this investigation. This decision was based on the view that this usage of a wetland within the watershed is unusual and the tidal stream therein is an important one.

Due to their greater inherent diversity wetland complexes were considered to have greater value, other things being equal, than those wetlands unassociated with other wetlands or water systems. Rationale for other criteria used in rating watershed nontidal wetlands for functional values have been previously discussed.

TABLE 5 BIG ANNEMESSEX RIVER WATERSHED
WETLAND SITE DATA

QTR.QUAD.	GRID	WETLAND NO.	TYPE	WAT. REG.	ACRES	FUNCTION VALUE CRITERIA		
						TOP	HIGH	MIDDLE
KNE	A1	1	PFO1/4	A	2.99			
KNE	A1	2	Pf		0.87			
KNE	A1	3	Pf		0.93			
KNE	A1	4	Pf		1.43			
KNE	A1	5	Pf		0.46			
KNE	A1	6	Pf		2.53			
KNE	A1	7	Pf		5.75			
KNE	A1	8	Pf		0.50			
KNE	A1	9	Pf		0.81			
KNE	A1	10	Pf		0.92			
KNE	A1	11	Pf		3.79			
KNE	A1	12	Pf		0.64			
KNE	A1	13	PFO1	A	0.70			1
KNE	A1	14	PFO1/4	A	24.84		6,7	
KNE	A1	15	Pf		0.51			
KNE	A1	16	Pf		0.94			
KNE	A1	17	PEM1x	B	1.07		4	
KNE	A1	18	Pf		1.15			
KNE	A2	1	PFO4	A	5.75		6	
KNE*	A2	2	PSS1	A	13.80		6	2
KNE	A2	3	PEM1	C	5.58		6	
KNE	A2	4	Pf		2.07			
KNE	A2	5	Pf		0.70			
KNE	A2	6	Pf		0.51			
KNE	A2	7	Pf		0.43			
KNE	A2	8	PFO4/1	A	4.25			
KNE	A2	9	PEM/SS1	C	2.70		6	
KNE	A2	10	PEM1	C	14.83		6	
KNE	A2	11	PEM1	C	9.78		6	
KNE	A3	1	PEM1	C	0.10			
KNE	A3	2	R4SB3x		0.60			
KNE	A3	3	PFO1/4	A	7.00		6	
KNE	A3	4	PSS1	A	11.73		6	
KNE	A3	5	PSS1	A	2.76		6	
KNE	A3	6	PFO1d	E	19.32			3
KNE*	B1	1	PFO1	C	2.59			
KNE	B1	2	Pf		0.69			
KNE	B1	3	Pf		0.53			
KNE	B1	4	Pf		0.43			
KNE	B1	5	Pf		0.94			
KNE	B1	6	POWx	H	0.63			
KNE	B1	7	PEM1	C	1.84			
KNE	B1	8	POWx	H	1.03			

BIG ANNEMESSEX RIVER WATERSHED
WETLAND SITE DATA

QTR.QUAD.	GRID	WETLAND NO.	TYPE	WAT. REG.	ACRES	FUNCTION VALUE CRITERIA		
						TOP	HIGH	MIDDLE
KNE	B1	9	POWx	H	0.70			1
KNE	B1	10	POWx	H	2.80			
KNW	A1	1	Pf		0.39			
KNW	A1	2	Pf		0.45			
KNW	A2	1	POWx	J	11.73		4	
KNW	A2	2	Pf		0.80			
KNW	A2	3	Pf		1.38			
KNW	A2	4	Pf		0.57			
KNW	A2	5	Pf		0.85			
KNW	A2	6	PFO4/1	A	7.36			3
KNW	A2	7	PFO1	A	1.84		6	
KNW	A2	8	PEM1	C	3.68		6	
KNW	A2	9	PFO4	A	2.53		6	
KNW	A2	10	PFO4/1	A	1.40		6	
KNW	A2	11	PFO1	A	2.07		6	
KNW	A2	12	PFO3/1	A	1.36		6	
KNW	A2	13	R4SB3		0.20			4
KNW	A3	1	PFO4/1	A	3.91		9	
KNW	A3	2	Pf		0.27			
KNW	A3	3	R1UB3		0.46		9	
KNW	A3	4	POWx	H	0.07			2
KNW*	A4	1	PSS1	A	18.38			3
KNW	A4	2	PEM1x	E	0.20			
KNW	A4	3	POWx	H	0.32			
KNW	A4	4	PFO1	A	7.82		6	
KNW	A4	6	PEM/SS1	C	2.75			
KNW	A4	7	PEM/SS1	C	0.40			1
KNW	A4	8	PEM/SS1	C	0.78			1
KNW	A4	5A	POWx	H	0.53			
KNW	A4	5B	POWx	H	0.20			
KNW	A5	1	PFO/SS1	E	2.07			1
KNW	A5	2	POWx	H	0.14			
KNW	A5	3	PEM1	E	0.30			
KNW	A5	4	Pf		0.46			
KNW	A5	5	POWx	H	4.10			
KNW	A5	6	R4SB3x		0.31			
KNW	B1	1	PFO1	A	0.30			
KNW	B1	2	PFO1	C	2.85			
KNW*	B2	1	PFO1d	A	91.30		7	
KNW	B2	2	Pf		0.50			
KNW	B2	3	PFO4/1	A	3.22			
KNW	B2	4	PFO4/1	A	2.76			
KNW	B3	1	POWx	H	0.37			

BIG ANNEMESSEX RIVER WATERSHED
WETLAND SITE DATA

QTR.QUAD.	GRID	WETLAND NO.	TYPE	WAT. REG.	ACRES	FUNCTION VALUE CRITERIA		
						TOP	HIGH	MIDDLE
KNW	B3	2	PFO1/4	A	4.60		6	
KNW	B3	3	R1UB3x		0.99		9	
KNW	B3	4	PFO1	A	9.89		6	
KNW	B3	5	PSS/EM1	A	1.33			1
KNW	B3	6	PFO1	A	1.33			1
KNW	B3	7	PUBx	H	0.25			
KNW	B3	8	PFO1	C	1.65			
KNW	B3	9A	PSS/EM1	C	0.69			1
KNW	B3	9B	PSS/EM1	C	0.34			1
KNW	B3	10	Pf		0.50			
KNW	B3	11	POWx	H	0.44			
KNW	B3	12	Pf		0.86			
KNW	B3	9A	PSS/EM1	C	0.69			
KNW	B3	9B	PSS/EM1	C	0.34			
KNW*	B4	1	PEM1	E	1.40			
KNW	B4	2	R1UB3x		0.53		9	
KNW	B4	3	PFO4	A	0.87		9	
KNW	B4	4	Pf		0.98			
KNW	B4	5	PEM1	E	0.30			
KNW	B4	6	Pf		0.48			
KNW	B4	7	Pf		0.44			
KNW*	B5	1	PSS/EM1	C	2.02		8	
KNW	B5	2	PFO1	A	1.27			
KNW	B5	3	PSS1	C	0.53			
KNW	B5	4	POWx	H	5.52			3
KNW	B5	5	PEM1	C	3.45			
KNW	B5	6	PSS1	C	5.98		6	
KNW	B5	7	----				1	
KNW*	C1	1	PSS1	B	0.70		4,8	
KNW	C1	2	Pf		0.44			
KNW	C1	3	PFO4/1	A	0.85			
KNW*	C1	4	R1UB3				9	
KNW*	C2	1	PFO1/4	A	15.50		10	2
KNW*	C2	2	PFO1	F	1.15		4	2
KNW*	C2	3	R1UB3x		3.09		9	
KNW	C2	4	Pf		0.29			
KNW	C2	5	PFO1	A	2.30			
KNW	C2	6	PEM1	A	0.28			
KNW	C2	7	PEM1	A	0.92			
KNW	C2	8	PFO1	A	3.70			
KNW	C2	9	PFO1	C	0.30			
KNW	C2	10	PEM1	E	0.30			
KNW	C2	11	PEM1	A	2.41			

BIG ANNEMESSEX RIVER WATERSHED
WETLAND SITE DATA

QTR.QUAD.	GRID	WETLAND NO.	TYPE	WAT. REG.	ACRES	FUNCTION VALUE CRITERIA		
						TOP	HIGH	MIDDLE
KNW	C2	12	Pf		0.50			
KNW	C2	13	Pf		0.39			
KNW*	C3	1	PEM1	E	0.60	1	6	2
KNW*	C3	2	PFO4/1	C	1.84	1	6,8	
KNW*	C3	3	PEM1	E	2.50			
KNW*	C3	4	POWx	H	1.38	1	6,8	
KNW*	C3	5	R1UB3x		0.69	1	8	
KNW	C3	6	PFO1/4	A	3.22		6	
KNW	C3	7A	PF01/4	A	16.56			3
KNW	C3	7B	PEM1	B	0.34		4	
KNW*	C3	8	PEM1	C	0.80			
KNW	C3	9	Pf		2.53			
KNW	C3	10	Pf		0.30			
KNW	C3	11	PFO4/1	A	2.89			
KNW	C3	12	PFO1	A	6.67			
KNW	C3	13	PFO1x	B	0.38		4	
KNW	C3	14	PEM1	C	0.87			1
KNW	C3	15	PFO1	C	0.55			1
KNW	C3	16	PFO4/1	A	1.19			1
KNW	C3	17	PSS1	C	0.61			
KNW	C3	18	PFO1	A	1.38			
KNW	C3	19	PEM1	F	0.92		4,6	
KNW	C3	20	POWx	H	1.43			1
KNW	C3	21	PFO1	A	3.60			
KNW	C3	22	POWx	H	1.03			
KNW	C3	23	R2UB3		1.84	1	9	
KNW	C3	24	PFO1	A	19.55	1	6,7	
KNW	C3	25	R4SB3x		0.63			4
KNW	C3	7A	PFO1/4	A	16.56			3
KNW	C3	7B	PEM1	B	0.34			
KNW	C4	1	Pf		0.17			
KNW	C4	2	Pf		0.35			
KNW	C4	4	Pf		0.30			
KNW	C4	5	POWx	H	4.64			
KNW	C4	3A	PSS1	A	0.80			
KNW	C4	3B	PSS1	A	1.50			
KNW	C5	1	PFO1	A	26.45		6,7	
KNW	D1	1	PFO1	A	4.60		3	
KNW	D1	2	PFO1	A	4.40		3	
KNW	D1	3	PFO1/4	A	11.27			1,3
KNW	D2	1	PFO1	A	5.30			1
KNW	D2	2	PSS1	C	1.84			1,3
KNW	D2	3	R4SB3x		3.10			4

BIG ANNEMESSEX RIVER WATERSHED
WETLAND SITE DATA

QTR.QUAD.	GRID	WETLAND NO.	TYPE	WAT. REG.	ACRES	FUNCTION VALUE CRITERIA		
						TOP	HIGH	MIDDLE
KNW	D2	4	PSS1	A	2.76			
KNW	D2	5	R4SB3x		1.30			4
KNW	D2	6	PEM1	C	2.07			
KNW	D2	7	PFO1	A	0.83			
KNW	D2	8	PFO1	A	4.02			
KNW	D2	9	PSS4	A	2.98			
KNW	D2	10	PFO1	A	2.76			
KNW	D2	11	PSS1	A	3.22		6	
KNW	D3	1	Pf		3.68			
KNW	D3	2	POWx	H	0.30			
KNW	D3	3	POWx	H	0.30			
KNW	D3	4	Pf		0.32			
KNW	D3	5	Pf		0.37			
KNW	D3	6	Pf		0.30			
KNW	D3	7	R2UB3		1.84		9	
KNW	D3	8	PFO1	A	1.03			1
KNW	D3	9	PEM1	C	0.43			1
KNW	D3	10	R4SB3x		2.23			4
KNW	D3	11	POWx	H	0.30			
KNW	D3	12	R4SB3x		1.07			4
KNW	D4	1	PFO1	A	1.17			
KSW*	A1	1	PFO1/4	C	3.40			2
KSW	A1	2	Pf		1.95			
KSW	A1	3	R4SB3X		1.38			
KSW	A1	4	R4SB3X		0.54			
KSW	A2	1	POWx	H	6.97	1		
KSW	B1	1	PFO1/4	A	1.84			
KSW	B2	1	PEM1	C	0.80			
MNE	A2	1	POWx	H	0.14			
MNE	A2	2	Pf		0.51			
MNE*	A3	1	PFO4/1	E	26.20		6,7	
MNE	A3	2	PFO4	E	4.60		6	
MNE*	A3	3	PFO4	A	8.05		6	
MNE*	A3	4	PEM1	C	1.38		6	
MNE	A3	5	PFO4	C	9.43		6	
MNE	A3	6	PEM1	C	1.15		6	
MNE	A3	7	PEM1	E	2.76		6	
MNE	A3	8	PFO4/1	C	5.52		6	
MNE	A3	9	PEM1	C	0.30			
MNE	A3	10	PFO/SS1	A	19.32		6	
MNE	A3	11	PEM1	E	4.83		6	
MNE	A3	12	Pf		0.50			
MNE	A3	13	PSS4/1	C	10.81		6	

BIG ANNEMESSEX RIVER WATERSHED
WETLAND SITE DATA

QTR.QUAD.	GRID	WETLAND NO.	TYPE	WAT. REG.	ACRES	FUNCTION VALUE CRITERIA		
						TOP	HIGH	MIDDLE
MNE	A3	14	POWx	H	0.92			
MNE	A3	15	Pf		1.15			
MNE	A3	16	Pf		0.50			
MNE	A3	17	PFO1/4	A	3.91		6	
MNE	A3	18	PFO1/4	A	5.52		6	
MNE	A3	19	PEM1d	E	24.38		6,7	
MNE	A3	20	PFO/SS1	E	17.71		6	
MNE	A3	21	PFO1	C	4.00			
MNE	B2	1	PFO1/4	A	6.67			
MNE	B2	2	PSS4/1	A	1.45		6	
MNE	B2	3	PFO1/4	A	2.30			
MNE	B2	4	POWx	H	0.30			
MNE	B2	6	PSS4/1	A	1.38		6	
MNE	B2	7	PSS1	A	3.22			
MNE	B2	8	PFO1	A	8.05			
MNE	B2	9	PFO4/1	A	2.76			
MNE	B2	10	PFO4/1	A	5.63			
MNE	B2	11	PFO1	A	7.36			
MNE	B2	12	POWx	H	0.70			
MNE	B2	13	PFO1	A	36.80		6,7	
MNE	B2	5A	PFO1	A	5.98			
MNE	B2	5B	PFO1	A	0.46			
MNE	B3	1	PFO1	A	2.76			3
MNE	B3	2	PFO1	A	1.15			3
MNE	B3	3	PFO1d	A	18.17			1,3
MNE	B3	4	PSS/EM1	C	20.01		6,7	
MNE	B3	5	PSS1/4	C	1.61			
MNE*	C2	1	PFO4/1	A	11.27			3
MNE	C2	2	PSS1/4	A	15.41		7	
MNE	C2	3	PFO4	A	9.66		7	
MNE	C2	4	PFO1/4	A	28.06		7	
MNE	C2	5	Pf		0.46			
MNE	C2	6	Pf		0.92			
MNE	C2	7	Pf		0.50			
MNE	C3	1	PSS3/1	C	15.41		5,6	
MNE	C4	1	PEM/SS1	C	0.30			
MNE	C4	2	Pf		0.50			
MNE	C5	1	Pf		1.84			
MNE	C5	2	Pf		0.63			
MNE	C5	3	Pf		0.93			
MNE	C5	4	PFO4	A	2.53			
MNE	D2	1	PFO4/1	A	1.50			
MNE	D2	2	PFO1	A	22.54		7	

BIG ANNEMESSEX RIVER WATERSHED
WETLAND SITE DATA

QTR.QUAD.	GRID	WETLAND NO.	TYPE	WAT. REG.	ACRES	FUNCTION VALUE CRITERIA		
						TOP	HIGH	MIDDLE
MNE	D2	3	Pf		0.80			
MNE	D2	4	PSS3/1	A	3.68		5	
MNE	D2	5	PEM1	E	0.23			
MNE	D2	6	PFO1	A	1.15			
MNE*	D4	1	PFO1	A	20.70		6,7	
MNE	D4	2	PEM1	E	1.38			
MNE	D4	3	Pf		0.57			
MNE	D4	4	PSS1	A	1.40			1
MNE	D4	5	PFO1	A	1.84			1
MNE	D4	6	PFO4/1	A	6.44		6	
MNE	D4	7	PFO1	A	3.22		6	
MNE	D4	8A	Pf		0.57			
MNE	D4	8B	Pf		0.80			
MNE	D5	1	PFO/SS1	E	1.15			1
MNW	C3	1	PFO4	A	5.01		6	
MNW	C3	2	PFO4/1	C	6.21		6	
MNW*	D3	1	PSS1	B	2.07		4,6	
MNW*	D3	2	PEM1	E	1.15		6	
MNW	D3	3	PFO1	C	2.00		5,6	
MNW	D3	4	PEM1	C	0.30		6	
MNW	D3	5	PEM1	C	0.33		6	
MNW	D3	6	PFO1	A	1.88			
MNW	D3	7	PFO4/1	A	1.93			
MNW	D3	8	PEM1	E	0.30		6	
MNW	D3	9	PSS1	A	0.78		6	
MNW	D3	10	PSS1	A	2.12		6	
MNW	D3	11	PSS1	C	0.92		6	
MNW	D3	12	PFO1	A	1.38		6	
MNW	D3	13	PSS1	E	1.15		6	
MNW	D3	14	PFO4/1	A	8.74		6	
MNW	D3	15	PFO4/1	C	5.30		6	
MNW	D3	16	PFO1	C	2.18		6	
MNW	D3	17	PFO4	A	4.60		6	
MNW	D3	18	POWx	H	0.37		6	
MNW*	D4	1	PFO1	C	2.53		6	
MNW	D4	2	PFO4	C	1.49		6	
MNW	D4	3	PEM1d	E	28.52		6,7	
MNW	D4	4	PSS1	A	1.73		6	
MNW	D4	5	PEM1	E	0.48			
MNW	D4	6	POWx	H	0.40			
MNW	D4	7	PEM1	E	0.35			
MNW	D4	8	PEM1	E	2.30		6	
MNW	D4	10	PFO4	A	3.91		6	

BIG ANNEMESSEX RIVER WATERSHED
WETLAND SITE DATA

QTR.QUAD.	GRID	WETLAND NO.	TYPE	WAT. REG.	ACRES	FUNCTION VALUE CRITERIA		
						TOP	HIGH	MIDDLE
MNW	D4	11	PSS1	E	4.14		6	
MNW	D4	12	PSS4/1	C	4.37		6	
MNW	D4	14	PFO4/1	C	2.76		6	
MNW	D4	15	PFO1	C	1.30		6	
MNW	D4	16	PFO4	C	10.81		6	
MNW	D4	17	POWx	H	0.29			
MSE	A2	1	Pf		0.35			
MSE	A3	1	PFO4/1	A	3.22			
MSE	A3	2	Pf		0.35			
MSE*	A4	1	PFO1	A	7.60			3
MSE*	A4	2	PSS1	B	2.76		5,6	
MSE*	A4	3	PSS/EM1	B	13.34		5,6	
MSE*	A4	4	POWx	H	8.51		6,8	
MSE	A4	5	POWx	H	4.60		6	
MSE	A4	6	Pf		0.46			
MSE	A4	7	Pf		0.20			
MSE	A4	8	PFO1	A	15.64			3
MSE	A4	9	PFO1/4	A	10.12			3
MSE	A4	10	PEM/PSS	A	6.10		6	
MSE	A5	1	POWx	H	0.21			
MSE*	B2	1	R1SB3		0.69		9	
MSE	B2	2	Pf		0.62			
MSE	B2	3	Pf		2.53			
MSE	B2	4	PFO1/4	C	2.99		5	
MSE	B2	5	Pf		1.03			
MSE*	B2	6	PEM1	B	0.92		4,8	
MSE	B2	7	PFO1	A	5.30		5	
MSE	B3	1	PEM1	C	1.03			1
MSE	B3	2	Pf		0.28			
MSE	B3	3	POWx	H	0.16			
MSE	B3	4	PEM1	C	1.05			
MSE	B3	5	POWx	H	0.37			
MSE	B3	6	PFO1	E	0.46			
MSE*	B4	1	POWx	H	3.00		8	
MSE	C1	1	Pf		0.57			
MSE	C1	2	PFO1	A	3.45			
MSE	C1	3	Pf		2.99			
MSE	C1	4	PFO1	A	12.42	1	6	
MSE	C1	5	PFO1/4	C	45.77	1	6,7	
MSE	C1	6	PSS1	A	0.92	1	6	
MSE	C1	7	PSS1	A	0.92			1
MSE	C1	8	PEM1	C	3.10	1	6	
MSE	C1	9	PFO4	A	0.80			

BIG ANNEMESSEX RIVER WATERSHED
WETLAND SITE DATA

QTR.QUAD.	GRID	WETLAND NO.	TYPE	WAT. REG.	ACRES	FUNCTION VALUE CRITERIA		
						TOP	HIGH	MIDDLE
MSE*	C2	1	PFO1	E	94.07	1	2,6,7,8	
MSE*	C2	2	POWx	H	2.88		8	
MSE	C2	3	PFO4/1	A	28.75	1	6,7	
MSE	C2	4	Pf		0.57			
MSE	C2	5	Pf		20.24			
MSE	C2	6	Pf		10.35			
MSE	C2	7	PFO1/4	A	4.83			
MSE	C2	8	POWx	H	2.64		6	
MSE	C2	9	PFO1	A	4.60		6	
MSE	C2	10	PFO4/1	A	4.14		6	
MSE	C2	11	PFO1	A	21.62		7	
MSE	C2	12	PFO1	A	3.45			
MSE	C2	13	Pf		0.92			
MSE	C2	14	PEM1	C	1.15			1
MSE	C2	15	PEM1	A	0.86			1
MSE	C2	16	PFO1/4	A	1.32			1
MSE	C3	1	Pf		0.18			
MSE	D1	1	PFO4	A	39.10	1		
MSE	D1	2	PFO1/4	A	13.80	1		
MSE	D1	3	PEM1	E	0.46	1		
MSE*	D2	1	POWx	H	2.65		6,8	
MSE	D2	2	PFO1	A	24.80	1	6,7	
MSE	D2	3	POWx	H	4.83			
MSE	D2	4	PFO1	A	1.61			
MSE	D2	5	PEM1	C	0.40		6	
MSW	C3	1	PEM1	A	0.30			
MSW	C3	2	PFO1/4	C	1.84			
MSW	C3	3	PFO1/4	A	2.76			
MSW	C3	4	PSS1	A	0.57			
MSW	C4	1	PFO4/1	A	0.35			
MSW	C4	3	POWx	H	0.18			
MSW	C4	4	PFO1	H	1.61			
MSW	C4	2A	PEM1	E	0.70			
MSW	C4	2B	PEM1	E	0.72			
MSW	D2	1	PFO4/1	A	2.07			1
MSW	D2	2	PSS1	A	0.25			
MSW	D2	3	PEM1	C	0.74			
MSW	D2	4	PSS1	A	0.69			
MSW	D3	2	POWx	H	0.29			
MSW	D3	3	PEM1	A	0.33			
MSW	D3	4	POWx	H	0.26			
MSW	D3	5	POWx	H	0.34			
MSW	D3	6	POWx	H	0.50			

BIG ANNEMESSEX RIVER WATERSHED
WETLAND SITE DATA

QTR.QUAD.	GRID	WETLAND NO.	TYPE	WAT. REG.	ACRES	FUNCTION VALUE CRITERIA		
						TOP	HIGH	MIDDLE
MSW	D3	7	PEM1	C	8.74			3
MSW	D3	8	PEM1	A	0.30			
MSW	D3	1A	POWx	H	0.92			
MSW	D3	1B	POWx	H	0.46			
MSW	D4	1	PFO1	A	0.63			
MSW	D4	2	POWx	H	0.10			
MSW	D4	3	PFO1	A	0.10			
MSW	D4	4	Pf		0.25			
MSW	D4	5	Pf		0.41			
MSW	D4	6	Pf		0.31			
MSW	D4	7	Pf		0.42			
MSW	D4	8	Pf		0.43			
TOTAL					1666.63			
AVERAGE					4.20			
STANDARD DEVIATION					8.89			
* Indicates wetland where field sampling and functional assessment was conducted								

4.3 POTENTIAL MITIGATION SITES

Using photointerpretation techniques similar to those employed for identifying wetlands within the watershed, potential wetland creation sites were preliminarily identified. From information gathered in the field final site selections were made and mapped. Information on the sites selected are provided in Table 6 and in Figures A1-A4 in the Appendix. The criteria used for selecting sites were:

1. Nonwooded

2. Adjacent to an existing wetland(s), or

3. Identified via photointerpretation as either a potential mitigation site or as a palustrine farmed site, both of which have standing water or saturated soils through at least the early part of the growing season, or

4. At least 50% of the soils are from the Pocomoke or Portsmouth series. These soils are poorly drained and make up just over 10% of the land area. Wetlands created on these sites should require less excavation than those created on sites containing other soil types.

In addition to the areas indicated as potential mitigation sites there are many other areas in the watershed where wetlands could be built. For example, all nonwooded sites adjacent to tidal wetlands should be considered as having at least moderate potential as candidate mitigation sites, given the ecological benefits that converting these areas to wetlands might provide. These benefits include:

1. Improving water quality by increasing the size of the vegetative buffer,

2. Providing increased habitat for the many faunal species to whom this type of habitat is critical,

TABLE 6 POTENTIAL MITIGATION SITES

	Site #	Tidal Wetlands	Adjacent To POW	PFO	PSS	PEM	Photointerpreted Mitigation Area	Palustrine Farmed	Soil Series 1	2	3	4	5	6
Marion N.E.	1			*			*					*		
	2	*		*	*		*		*					
	3	*		*			*	*				*		
	4			*	*		*	*	*					
	5	*					*	*	*	*		*		
Marion S.E.	1			*			*	*	*			*	*	*
	2	*						*	*	*		*		
	3	*						*		*		*		
	4	*				*	*		*	*		*		
	5		*	*			*					*	*	
	6		*	*					*					
Marian S.W.	1						*	*	*			*		
	2		*				*					*		
Kingston N.W	1			*			*		*	*		*		
Kingston N.E	1			*			*	*	*					*
	2		*				*	*	*				*	*
	3			*		*	*	*	*					*

Soil Series Legend

1 Othello
2 Matapeake
3 Johnston
4 Fallsington
5 Pocomoke
6 Portsmouth

IV. CUMULATIVE IMPACT ANALYSIS

1.0 LAND USE IN WATERSHED

The cumulative impact assessment effort focused on identifying relative losses of wetlands already sustained by the watershed and losses likely to occur in the future from projected land use activities. Information developed from this effort in combination with the functional assessment will assist agencies in making permit decisions and managing future growth relative to nontidal wetlands in the Big Annemessex River watershed. Results are shown in Figures A1-A4 in Appendix.

The land use features of the watershed, both wetland and non-wetland, are important elements in the assessment of cumulative impacts. The Annemessex Watershed is completely contained within Somerset County, the southernmost county on the Maryland's Eastern Shore. The Annemessex Watershed is predominately a rural landscape with small crossroad villages located on the periphery of the watershed boundaries. As is typical on the Eastern Shore, the road network follows the higher ground which is generally the watershed divide. The small crossroad villages have located along the major road network that connects the numerous "necks" or peninsulas.

Three major land uses in the watershed are agriculture, forest lands and tidal wetlands. Two State natural resource management areas, Janes Island State Park and Fairmount Wildlife Management Area, are partially located in Annemessex Watershed. The existing residential development in the watershed is limited to small villages, farmsteads, scattered single family homes along the major roads, and limited waterfront residential Most residential development is north of Hopewell. The small crossroad communities include: Hopewell, Marion, Kingston, Westover, Manokin, and Fairmount.

1.1 METHODOLOGY FOR CUMULATIVE IMPACT ASSESSMENT

The cumulative impacts assessment utilized the nontidal wetland and functional analysis information previously developed. Somerset County's Comprehensive Plan, adopted in 1991, provided the main source for addressing cumulative impacts. The comprehensive plan provides the most recent planning document that identifies future growth areas in the County. The document identifies the broad planning goals and objectives intended to guide land use development patterns over the next twenty years. The goals in the comprehensive plan which were important to the preparation of the nontidal wetlands management plan were identified and involved the following areas: economic development, land use, environment and infrastructure. Some of the most relevant goals identified in the comprehensive plan are:

- o Encourage development in selected nodes or communities so as to preserve valuable farmland, and other sensitive areas, and to protect the County's traditional quality of life from unplanned sprawl.

- o Make efficient use of available capacity in existing community facilities, roads and infrastructure. In particular, the existing Town of Princess Anne, and other communities in the U.S. 13/413 corridor should be treated as "growth centers".

- o Coordinate the extension of water and sewer services with rezoning activities so as to channel development toward growth centers and into preferred community forms.

- o Respect sensitive environmental areas, such as floodplains, wetlands and the Critical Area Zone adjacent to streams, rivers and the Chesapeake Bay.

- o Retain and enhance wildlife management areas, riparian forest, greenways, scenic areas and unique open space areas.

- o Update the County Zoning Ordinance to encourage planned unit development and clustering in preferred areas, and to discourage spot zoning and sprawl. However, it should be noted that the 1976 ordinance designated some degree of development for most of the present growth areas, ranging from residential to commercial or industrial use.

The Somerset County Zoning Ordinance, was an additional source evaluated for estimating cumulative impacts. However, it was not applied, since it is not consistent with the recently adopted comprehensive plan. The Zoning Ordinance and Zoning Maps were adopted in 1976 with numerous amendments, including the Critical Area requirements, incorporated to the ordinance over time. Somerset County will be conducting a comprehensive rezoning process in the near future to bring the zoning requirements and maps into compliance with the comprehensive plan. Nevertheless, because it is intended that the comprehensive plan guide the rezoning process, it was determined that the comprehensive plan would be the primary source for evaluating cumulative impacts, rather than the zoning ordinance.

The land use map from the comprehensive plan was reviewed as part of the cumulative impact analysis. It demonstrates that the land use component of the comprehensive plan recognizes the County's agricultural base as the foundation of the County's economy. The plan seeks to preserve that base by clustering development in existing crossroad towns and restricting unplanned sprawl. It identifies these growth areas by concentric rings around existing communities. The plan identifies Primary Growth Nodes, intended for residential or mixed land uses with central water and sewer. The comprehensive plan also identifies Secondary Growth Areas, allowing limited infill development in waterfront communities with onsite septic systems or small-scale community treatment systems. Hopewell, Marion and Westover, all within the Annemessix watershed, have been identified as Primary Growth Nodes. Planned Unit Developments (PUDs), overlay zoning districts, and higher density bonuses are examples of planning tools which are being considered to direct development into the Primary Growth Areas.

Many of the Secondary Growth Areas do not currently have central sewer systems. Based on the comprehensive plan, proposed infill or expansion developments should be avoided in areas where have been septic system failures, unless innovative community solutions can be developed to address water quality and public health concerns. Secondary Growth Areas would be primarily residential in nature with supporting community services. Fairmount, Manokin and Marion are crossroad villages in the Big Annemessex watershed which have been identified as Secondary Growth Areas.

In order to utilize the comprehensive plan for evaluating cumulative impacts, the staff of the Somerset County Department of Technical and Community Services scaled the conceptual concentric rings depicting future growth areas in the watershed to correspond with actual land areas based upon land availability and suitability. The resulting information was drafted on 1"= 600' scale County zoning maps. These maps were then reduced and a composite was developed incorporating them, all the quarterquad base maps, and the 1"=2000' scale wetland, functional value and potential mitigation maps. In this manner information regarding significant wetland functions and values were related to projected development in the watershed. Particular wetlands, wetland types or wetland functions especially at risk were identified, and strategies were developed for avoiding or minimizing impacts relative to the watershed.

1.2 RESULTS OF CUMULATIVE IMPACT ASSESSMENT

1.2.1 PREVIOUS LAND USE CHANGES

According to the Department of State Planning mapping, the major land use changes in Somerset County from 1981-1985 were areas that were timbered and then left in brush prior to reforestation. This affected less than 5 percent of the total land area of the County.

The timbering that occurred was widely scattered throughout the County and generally did not affect tidal wetlands. A few areas of forest were converted to cropland, but relatively small areas of forests or croplands were converted to development during this period.

Between 1972 and 1981 larger areas of the County were converted from forested farmland to cropland. Some areas of wetlands were drained or filled and converted to cropland or forests. Several waterfront areas west and soutwest of Marion were also converted from cropland to development.

While the changes discussed above relate to Somerset County as a whole, a similar pattern is expected to have occurred within the Big Annemessex River watershed. Historical records of land use changes prior to 1972 were not readily available for review, but it is certain that a substantial portion of the watershed was originally converted from forest to farmland. It is speculated that perhaps up to half or more of the original forested wetlands have been lost in the watershed since settlement began. Since 1930, there has been a 30 percent decrease in cropland in the County from 61,000 acres to 42,000 acres in 1982 (Williams, 1993). Most of this cropland was re-converted to woodland. Thus, it is conceivable that a net gain in wetlands was achieved for that period. As stated above, prior to 1930 there was probably significant conversion of woodland and wetlands to farmland.

1.2.2 PROJECTED NONTIDAL WETLAND THREATS

The comprehensive plan provided the framework for evaluating an ultimate buildout scenario for the Big Annemessex watershed. The nontidal wetlands located within the growth centers are assumed to be threatened by potential development, either directly by excavation/filling or indirectly from secondary impacts related to land development. This does not mean, however, that the buildout scenario will in fact adversely impact all wetlands within the designated growth areas.

The designated growth areas and wetlands affected are illustrated on maps A1-A4. Since the County does not have at this time details regarding specific future development within the identified growth areas, proposed infrastructure and zoning changes cannot be mapped. As mentioned previously, the County will be undertaking a rezoning process which may incorporate some recommendations outlined in this document. Other than roads, the watershed presently has little infrastructure.

Limited minor subdivisions along the existing road network can be expected to continue. The creation of scattered single-family home development has been the historical pattern in most rural, Eastern Shore counties. A capture rate of 80 percent of the future residences into the growth centers is a reasonably conservative estimate. Unfortunately, there is no accurate way to predict adverse impacts to wetlands from scattered, single-family home development.

The land area within the Big Annemessex watershed proposed for expansion of crossroad communities amounts to 2,480 acres or approximately 10 percent of the developable land in the watershed (excluding tidal wetlands). In other words, approximately 90 percent of the developable land area in the watershed will remain in its existing land use. It is anticipated that few additional croplands will be created from areas in natural habitat. Hence, agriculture is not expected to lead to significant future conversion of forested wetlands to cropland.

Table 7 identifies the wetlands by type, acres and functional value that are located within the planned growth areas. Approximately 164.9 acres of threatened nontidal wetlands were identified within all the growth centers. This represents approximately six percent of the total growth area. Palustrine forested wetlands are the most prevalent of the threatened wetlands, accounting for 116 acres or approximately 70 percent of the threatened wetland acreage. Emergent wetlands and shrub-scrub wetlands both

TABLE 7. NONTIDAL WETLANDS WITHIN COMPREHENSIVE PLAN GROWTH CENTERS

Wetland Type	Growth Center	Wetland No.	Map ID	Acres	Value**
PEM	Hopewell	MSW D-4 7	PEM1C-7	8.74	M
PEM	Hopewell	MSW C-5 2A	PEM1E-2A	0.70	L
PEM	Marion	MSE B-3 4	PEM1C-4	1.05	L
PEM	Marion	MSE B-2 6	PEM1B-6	0.92	H 4,8
PEM	Hopewell	MSW C-4 2B	PEM1E-2B	0.72	L
PEM	Marion	MSE C-2 14*	PEM1C-14	1.15	M 1
PEM	Marion	MSE C-2 15*	PEM1A-15	0.86	M 1
PEM1	Westover	KNE A-2 3*	PEM1C-3	5.58	H 6
PEM1	Westover	KNE B-1 7	PEM1C-7	1.84	L
PEM1x	Westover	KNE A-1 17	PEM1Bx-17	1.07	H 4
subtotal				22.63	
PFO	Westover	KNE A-1 13	PFO1A-13	0.70	M 1
PFO1	Minokin	MNE B-2 1	PFO1/4A-1	1.11	L
PFO1	Minokin	MNE B-2 8	PFO1A-8	7.17	L
PFO1	Westover	KNW D-2 1	PFO1A-1	5.30	M 1
PFO1	Westover	KNW D-1 2	PFO1A-2	4.40	H 3
PFO1	Westover	KNW D-1 1	PFO1A-1	4.60	H 3
PFO1	Marion	MSE B-2 7	PFO1A-7	5.30	H 4,8
PFO1	Marion	MSE C-2 12*	PFO1A-12	3.45	L
PFO1	Marion	MSE C-2 11*	PFO1A-11	21.62	H 7
PFO1	Marion	MSE B-3 6	PFO1E-6	0.46	L
PFO1/4	Marion	MSE B-2 4*	PFO1/4C-4	2.99	H 5
PFO1/4	Westover	KNE A-1 1	PFO1/4A-1	2.99	L
PFO1/4	Marion	MSE C-2 7*	PFO1/4A-7	4.83	L
PFO1/4	Marion	MSE C-2 16*	PFO1/4A-16	1.32	M 1
PFO1/4	Westover	KNW D-1 3*	PFO1/4A-3	11.27	M 1,3
PFO1/4	Westover	KNE A-1 14*	PFO1/4A-14	24.84	H 6,7
PFO1/4	Hopewell	MSW C-4 3	PFO1/4A-3	2.76	L
PFO4	Westover	KNE A-2 1*	PFO4A-1	5.75	H 6
PFO4	Marion	MSE C-2 4*	PFO4A-4	1.61	L
PFO4/1	Hopewell	MSW C-5 1	PFO4/1 A-1	0.35	L
PFO1/4	Minokin	MNE B-2 3	PFO1/4 3	2.30	L
PFO1	Westover	KNW C-2 2	PFO1F-2	0.60	H
subtotal				115.72	
POW	Minokin	MNE B-2 4	POW Hx-4	0.30	L
POW	Minokin	MNE A-2 1	POW Hx-1	0.14	L
POW	Marion	MSE B-3 5	POW Hx-5	0.37	L
POW	Marion	MSE B-3 3	POW Hx-3	0.16	L
POWx	Westover	KNE B-1 10	POWHx-8	2.80	L
POWx	Westover	KNE B-1 8	POWHx-8	1.03	L
subtotal				4.80	

PSS1	Westover	KNW D-2 11*	PSS1A-11	3.22	H 6
PSS1	Westover	KNW D-2 4	PSS1A-4	2.76	M 4
PSS1	Westover	KNW D-2 2	PSS1C-2	1.84	M 1,3
PSS1	Westover	KNE A-2 2*	PSS1A-2	13.80	H 6; M 2
PSS4/1A	Minokin	MNE B-2 2	PSS4/1A-2	0.12	H 6
subtotal				21.74	

Total Threatened Wetlands: 164.891

* Wetlands excluded based on recommended re-configuration of growth area boundary

Farmed wetlands

Pf	MNE A-3 16	Pf-16	0.50	F
Pf	KNE A-1 18	Pf-18	1.15	F
Pf	KNE A-1 2	Pf-2	0.87	F
Pf	KNE A-1 16	Pf-16	0.94	F
Pf	KNE A-1 8	Pf-8	0.50	F
Pf	KNE A-1 6	Pf-6	2.53	F
Pf	KNW B-4	Pf-7	0.44	F
Pf	MSE C-3 1	Pf-1	0.18	F
Pf	KNE A-1 11	Pf-11	3.79	F
Pf	KNE A-1 10	Pf-10	0.92	F
Pf	KNE A-1 15	Pf-15	0.51	F
Pf	MSE B-3 2	Pf-2	0.28	F
Pf	MSE C-2 13	Pf-13	0.92	F
Pf	KNE A-2 4	Pf-4	2.07	F
Pf	KNE A-1 9	Pf-9	0.81	F
Pf	KNE A-1 7	Pf-7	5.75	F
Pf	KNE A-2 7	Pf-7	0.43	F
Pf	KNE A-1 5	Pf-5	0.46	F
Pf	MNE A-2 2	Pf-2	0.51	F
Pf	KNE A-1 4	Pf-4	1.43	F
Pf	KNE A-1 3	Pf-3	0.93	F
Pf	KNE A-1 12	Pf-12	0.64	F
total:			26.56	

** See Table 4 for HIGH (H), MIDDLE (M) and LOW (L) rank criteria applicable to each listed wetland account for approximately 22 acres or 14 percent of the threatened wetlands. Ponds account for almost 5 acres or 3 percent, and wet farm fields account for 26 acres, although the latter are not considered actual wetlands and are not factored into the total.

The Functional Value Criteria of wetlands located within the proposed growth centers are compiled in Table 7, together with each wetland's identification number, type, impacted acreage and functional value criteria. None of the Top Value wetlands are present, but 95 acres or 58 percent of the threatened wetlands in growth areas are High Value wetlands. This represents only 11.5 percent of all High Value wetlands in the watershed, however. Moderate Value and Low Value wetlands each comprise about 33 acres or 21 percent of the wetlands in all growth centers. These figures represent 15 percent and 10 percent respectively of the total wetland acreage for these wetlands. By cross-referencing the functional value codes in Table 7 with those of Table 4 (as well as Tables 2 and 3, as appropriate), the specific functions expected to be impacted by development can be identified for each wetland within the growth centers.

A comparison of the wetland acreages and values within the growth centers to those throughout the watershed revealed that, in general, suitable areas for expansion were chosen during the comprehensive planning process. In this portion of Somerset County, very few large contiguous areas of uplands are present. The areas chosen as growth centers reflected the historical settlement pattern, the provision of adequate infrastructure and a desire to preserve existing agricultural land uses. Specific recommendations concerning each of the proposed growth areas are described in the following section.

1.3 RECOMMENDATIONS

1.3.1 LAND USE

The cumulative impact assessment provides the opportunity to evaluate the potential impacts to wetland resources that may result from the implementation of the comprehensive plan objective to concentrate future development in the crossroad villages. Where appropriate, specific recommendations are provided to modify the proposed growth areas to protect high value wetland complexes. The opportunity to refine the proposed expansions of crossroad villages will occur when Somerset County initiates the comprehensive rezoning process. Modifications to the proposed growth centers are suggested in Figures A1 through A4, and can be incorporated into the proposed rezoning maps. A discussion of potential wetland impacts and recommendations within each proposed growth center follows.

Hopewell Primary Growth Area. The Hopewell growth center anticipates residential, commercial and airport-related development on approximately 252 acres within Annemessix watershed. The threatened wetlands within this growth center include isolated palustrine forested, emergent and open-water wetland types, totaling 13 acres or approximately five percent of the growth area. Most of the wetlands are of low wetland value. This growth area appears to be highly suitable for expansion.

Marion Primary Growth Area. This growth area includes two parts, a smaller area to the south of Coulbourne Creek and a larger area to the north of Coulbourne Creek and adjacent to Route 413. The total acreage of both areas is 675 acres, of which 46 acres (seven percent) are nontidal wetlands. Overall, 13 wetlands are present in this growth area. Although the majority of wetlands are low value, the High Value wetlands present account for 31 acres or 67 percent of the total wetlands in this growth area. Development on the south side of Coulbourne Creek would have the potential for minimal adverse impacts to wetlands present. Only small, isolated emergent, open-water and forested wetlands are present. Development on the north side of Coulbourne Creek, however, includes several large palustrine forested wetlands, one which is approximately 22 acres in size. A reconfiguration of the proposed growth area is recommended which would eliminate the northern third of this growth area (see Figures A3 and A4). Additional land along Coulbourne Creek which does not have significant wetland resources can be added to the Marion growth area to compensate. This reconfiguration would remove eight wetlands, including 25 acres of High Value wetlands, from the threat of growth (see Table 7 for details).

Kingston Secondary Growth Area. The Kingston growth area is anticipated to capture additional residential development on approximately 176 acres. No nontidal wetlands are located within this growth area. Consequently, this proposed growth area is the most suitable of all the proposed areas for allowing additional growth while minimizing impacts to wetland resources.

Westover Primary Growth Area. This growth area includes two sections and encompasses the largest land area within the watershed, totalling 1,142 acres. There are 17 wetlands in the growth area for a total of 94 acres. Eight of these wetlands are High Value wetlands and they comprise 67 percent of the wetlands present. The smaller segment of the growth area to west of Route 413 does not include any wetlands. The larger segment to the east of Route 413 and extending to Route 13 contains a large wetlands complex of High Value emergent, shrub-scrub and forested wetlands totalling 63 acres or 67 percent of the wetlands present in the growth area. A reconfiguration of this growth area is recommended to remove this wetland complex located in the south central portion of the growth area (see Figure A-2). There is available land in the vicinity, not constrained by significant wetland resources, to compensate for this modification of the growth area. This reconfiguration would remove the threat from development to 53 acres of high value wetlands (see Table 7 for details).

Manokin Secondary Growth Area. Of the 237 acres in this growth area, only 9 acres (four percent) are nontidal wetlands. Five wetlands are located within this growth area and 99 percent of the wetlands present are considered low value wetlands. Only one High Value wetland of .12 acres or 1 percent is present. This growth area provides a suitable land area for clustering new residential development while minimizing impacts to wetland resources.

Fairmount Secondary Growth Area. It is recommended that only infill development/redevelopment be allowed in this growth area. No vacant land area for expansion is recommended because of the extensive wetlands surrounding this crossroad village. Many High Value emergent, shrub-scrub, and forested wetlands have been identified in this portion of the watershed. Immediately outside of the privately-held land in the village is the Fairmount Wildlife Management Area.

1.3.2 FLOODPLAIN MANAGEMENT

Somerset County enacted a revised Floodplain Management Ordinance in 1992 (Ordinance No. 519) in compliance with Maryland's Flood Control and Watershed Management Act, Section 89A01 et seq. Natural Resources Article of the Annotated Code of Maryland. Somerset County's floodplain regulations address the County's responsibility under the National Flood Insurance Act of 1968, as amended, and the Flood Disaster Protection Act of 1973, as amended. Counties must to adopt and enforce floodplain management regulations which meet the requirements of 44 Code of Federal Regulations Parts 5577, et seq., in order to participate in the National Flood Insurance Program and remain eligible for federally subsidized flood insurance, federal disaster relief, and federal and State financial assistance.

The low-lying landscape of Somerset County's Coastal Plain results in an extensive 100-year floodplain. Normal land development activities in these low-lying areas have only a very limited impact on the extent and intensity of major storm events. The County's floodplain ordinance does not prohibit residential uses within the 100 year floodplain such a prohibition would be a severe restriction on private property rights in these circumstances. The ordinance does, however, prohibit development in the floodplain when alternative locations on the property in question are available that are outside of the floodplain. The burden is placed on the applicant to demonstrate that new structures cannot be located out of the floodplain and that encroachments onto the floodplain are minimized. In the subdivision of land, design consideration must be given to clustering development out of the floodplain. The lowest floor of new residential structures must be elevated above the 100-Year Flood Elevation.

Nontidal wetlands watershed management plans are required to consider floodplain management issues because it is known that the timing and intensity of flooding can be affected by the presence or absence on nontidal wetlands. In the case of the Big Annemessex watershed, no strong linkage can be drawn between wetland resources in the watershed and flooding issues. The flood control functions of the wetlands are poorly performed by most wetlands in this watershed. In this low-lying portion of the Eastern Shore, tidal and bay-related flooding are more important factors than the limited flood control functions performed by nontidal wetlands in the watershed. The Citizen Task Force, which was established to assist in developing the Wetlands Watershed Management Plan indicated that flood control concerns were not a significant issue and that the watershed plan should not emphasize flooding issues.

1.3.3 WATER SUPPLY MANAGEMENT

Within the Annemessex watershed, private wells are the predominant source of potable water for residential use. Only the town of Fairmount and surrounding area is located in an existing Water and Sewer Service Area. The Fairmount service area serves a population of approximately 550 out of an estimated total population of 650 (Somerset County 1991). A small portion of the Westover and Hopewell growth areas within the Big Annemessex watershed fall within the Three to Ten-Year Proposed Service for expansion of water and sewer infrastructure. Marion was previously included in the 1986 Proposed Ten Year Water and Sewer Service Area but was subsequently excluded from the planned expansion area for reason of cost.

Somerset County has established Groundwater Management Areas within the County to protect the water quality of the underlying aquifers which provide all of the County's potable water supply. Throughout the majority of the County's land area, fairly thick clay and silt confining beds protect the water supply from contamination. To the north and east of Princess Anne, and in the vicinity of Westover and Pocomoke City, the soils are extremely permeable down to the underlying aquifer. The potential for groundwater contamination from septic systems is significant in this area. Approximately 48 square miles of the County, including a very small portion of the Annemessex watershed in the vicinity of Westover, has been designated as Management Area A. Onsite systems in Management Area A are effectively restricted because these areas lack an "adequate treatment zone" (Somerset County 1991).

The remainder of the Big Annemessex watershed falls into Management Area B2 which is subject to normal septic field testing and permit approval. Management Area B2 is characterized by the presence of thick surficial confining beds of the Kent Island Formation which protect underlying Pocomoke and Manokin aquifers from the downward movement of surface and near-surface contaminants. Water supplies in this management area are derived primarily from wells screened in fairly deep confined aquifers including (from shallowest to deepest) the Pocomoke, Manokin, Magothy and Patapsco aquifers (Somerset County Groundwater Protection Report, undated). Some older, shallow wells may be scattered throughout the study area.

Because nontidal wetlands can play an important role in re-supplying potable water to groundwater resources, the Maryland Department of Natural Resources has included a water supply element to the development of nontidal wetlands watershed management plans. In the case of the Big Annemessex watershed, however, groundwater discharge functions are poorly performed by most wetlands in the watershed. There are no strong linkages between the nontidal wetlands present in the watershed and the provision of private and public water supply to residents within the watershed. The Citizens Task Force on the Big Annemessex Wetlands Watershed Management Plan did not indicate that any significant water supply issues are present in the study area.

2.0 PROTECTION MEASURES

2.1 WATERSHED ISSUES AND MANAGEMENT GOALS

Issue identification and the development of watershed management goals are key components of the nontidal wetlands watershed management planning process. Somerset County has approached the identification of watershed issues and management goals by creating a Citizens Task Force which represents the various interests of watershed residents. Several task force meetings were held to develop a preliminary list of watershed issues, refine the list of issues, delete issues which were beyond the scope of this planning process, and select a distilled list of watershed issues.

The key watershed issues and management goals which evolved from the task force meetings were:

o **Loss of Wetland Resources**. It was acknowledged that nontidal wetlands are prevalent throughout the watershed and that there was a strong likelihood that some wetland impacts can be anticipated from residential development. The task force supported State and Federal resource management goals regarding the "No Net Loss" policy.

o **Water Quality**. The task force identified water quality in nontidal surface waters and in the tidal estuary of the Big Annemessex River as a significant issue. The recommended management goal is to maintain, and where possible, enhance water quality in the Big Annemessex watershed.

o **Aquatic Resources**. The importance of Somerset County's relationship to the Chesapeake Bay was made by several task force members. Impairment of the aquatic resources in the nontidal and asterion system was a significant issue raised by the task force. The recommended management goal is the maintenance and enhancement of the finfish and shellfish resources in the Annemessex watershed.

Water quality within the Big Annemessex River is considered good (Maryland Department of the Environment, 1993). Low dissolved oxygen and elevated organic carbon levels were measured in the tidal portion the river, and were attributed to natural drainage from extensive adjacent tidal marshes. Due to elevated bacterial levels in the tidal waters, 0.16 square miles of the estuary are restricted to shellfish harvesting. Another 2.84 square miles are presently classified as conditionally approved. In August of 1989 one die-off of blue crabs was reported in Coulbourne Creek. No cause was identified, but the abundance of filamentous algae was suggested as a possible factor. While no stream sampling has been done within the Big Annemessex River watershed to document aquatic species, Table A-5 in the Appendix lists fish species expected to be found based on sampling of a stream in an adjacent watershed (Jesien, et al, 1990).

It was the intent of the Task Force to focus on land development threats to nontidal wetland resources. Although historically, there has been extensive conversion of nontidal wetlands to croplands, the members of the task force did not anticipate any significant potential for future conversions due to economic conditions and USDA "Swampbuster" provisions. Forest harvest operations in or adjacent to nontidal wetlands were discussed during the task force meetings. The discussions resulted in a determination that ongoing State forestry programs on developing "Best Management Practices" for timber harvest operations should be encouraged. The County has a limited role in addressing this land use activity and there are ongoing State programs which address the impacts of forest harvest operations on nontidal wetland resources.

The identification of key issues and management goals for the watershed provides an opportunity to reevaluate potential mitigation sites and to propose recommendations for implementing nontidal wetland resource protection strategies. As provided earlier in this report, potential wetland creation sites were identified through photointerpretation and field techniques and evaluation of soil survey information. The sites identified included large areas where in-kind nontidal wetlands can perhaps be created in a cost-effective fashion and with a high probability for success.

A supplemental mitigation strategy is recommended for the Big Annemessex watershed that emphasizes, in some cases, wetland mitigation design and location that enhances water quality and aquatic resource management goals with out-of-kind mitigation. For example, Mitigation sites adjacent to the existing stream network could be given high priority because they might enhance water quality and aquatic resource functions by providing additional buffers to trap sediments, nutrients and other pollutants. Nonwooded sites at the interface of tidal and nontidal surface waters provide opportune locations for water quality enhancement. Another opportunity is in the upper reaches of the first order streams or drainageways where nontidal wetland creation would not pose an impediment to agricultural drainage.

The Department of Natural Resources and U.S. Army Corps of Engineers would need to show some flexibility in reviewing individual wetland permits within the watershed in order for this alternative mitigation strategy to be successful. For example, some flexibility in allowing out-of-kind mitigation would be necessary. Palustrine forested wetlands are the most common wetland type within the watershed. The forested wetlands in the watershed do not exhibit high functional values for nutrient attenuation and sediment trapping, two indicators of the value of wetlands in enhancing water quality. Mitigation design to enhance these functional values would tend towards shallow wetland creations supporting emergent and shrub-scrub wetlands adjacent to the existing stream system. This would be considered out-of-kind mitigation. Implementation of this alternative approach would not only increase the functional value of watershed wetlands in the areas of nutrient attenuation and sediment trapping, it would also increase the diversity of wetland types in the watershed. This alternative strategy, developed from a comprehensive evaluation of the wetland functions and incorporating clear watershed management goals, may receive a favorable review by the State and Federal review agencies.

2.2 RECOMMENDATIONS FOR IMPLEMENTING RESOURCE PROTECTION STRATEGIES

The following recommendations for implementing resource protection strategies are provided to illustrate some of the opportunities available for the preservation and enhancement of nontidal wetland and water quality resources in the Big Annemessex watershed. More specific options for enhancing water quality and aquatic resources are outlined in Tables 8a and 8b.

- <u>Somerset County Chesapeake Bay Critical Area Program</u>. Because of the low-lying topography in the stutdy area, the tidal influence extends a considerable distance up the tributaries to the Big Annemessex watershed. Hence, the Critical Area encompasses a large portion of the entire watershed. Section 9.2 of the Somerset County Chesapeake Bay Critical Area Program (Rogers, Golden & Halperin, 1990) describes the nontidal wetlands protection element of the plan. Individual Critical Area reviews of proposed development actions should be evaluated in light of the Big Annemessex Wetlands Watershed Management Plan. This Plan encourages the continued implementation of the County's Critical Area Program. While continuing support of the local Critical Area program should help protect the wetlands, it should be noted that as of October, 1993 the State Nontidal Wetlands Program assumed responsibility for nontidal wetlands within the Critical Area. This resolved the problems associated with two different sets of regulations within the state for the same resource.

- <u>Stream and Wetland Buffers</u>. The Somerset County Comprehensive Plan (1991) recommends that a minimum stream buffer of 50 feet and wider buffers in areas of degraded streams be implemented. This recommendation was based on an anadromous fish survey of Somerset County streams (Jesien et al 1990). The Critical Area requirements include a minimum 100-foot shoreline buffer and additional buffer requirements for wetlands and Habitat Protection Areas. An evaluation of stream buffer alternatives should be undertaken during the upcoming comprehensive rezoning effort, leading to incorporation of an appropriate stream buffer zoning requirement outside of the Chesapeake Bay Critical Area. Buffers can enhance water quality in the watershed by reducing the potential for erosion of stream banks, and reducing the amount of pollutants in surface runoff through filtration by vegetative uptake.

- <u>Easements</u>. Somerset County has prepared a Land Preservation and Recreation Plan for Somerset County (Urban Research & Development Corporation 1988). The Plan identifies a number of opportunities to preserve wetlands; agricultural lands; rare, threatened and endangered species habitat; and unique or diverse natural areas. The Big Annemessex Wetlands Watershed Management Plan supports these recommendations. Somerset County should encourage the public sector programs and private sector nonprofit organizations to evaluate opportunities for longterm preservation of nontidal wetland resources in the Annemessex watershed.

- Sediment Control and Floodplain Ordinances. Both the Sediment and Erosion Control (Ordinance No. 76) and the Floodplain Management (Ordinance No. 519) represent the local adoption of minimum State requirements. Both of the ordinances provide the foundation for effective local programs to control the adverse impacts associated with land development, including the transport of large sediment loads to streams and wetlands downstream of active construction sites. Upgrading of sediment and erosion control regulations should be considered to further address these problems. To provide for more effective cross-compliance, current definitions of wetlands should be incorporated into the ordinances along with statements concerning the protection of this resource.

- Stormwater Management. The above recommendation also applies to the stormwater management regulations for Somerset County, adopted in 1984. In addition, amendments to stormwater management regulations should be made to encourage the use of created wetlands for water quality enhancement. In the Big Annemessex watershed which consists of many small sub-basins discharging to tidal waters, water quantity concerns are less important than water quality concerns. In areas of residential development on previously agricultural lands, there are opportunities to integrate stormwater management designs with efforts to restore poorly functioning drainageways (eg. culverts blocked with sedimentation) and agricultural ditches to a more natural headwater stream, providing habitat and water quality benefits.

- Comprehensive Rezoning. The cumulative impact analysis identified portions of two proposed growth areas which should not be rezoned for higher density residential use because of the presence of High Value wetland complexes.

TABLE 8a.
BEST MANAGEMENT PRACTICES FOR AGRICULTURAL AND FORESTRY ACTIVITIES

Measure	Description	Advantages
Conservation Tillage	Tillage or planting system which uses plant residue to provide cover for 30 percent or more of the soil surface.	Reduces soil erosion.
Buffer streams and ditches	Channel for conveyance of runoff. Buffers provide filtration of runoff prior to entering the stream.	Reduces erosion, removes some sediment from runoff.
Cover Crops	Close-growing grasses, legumes, or grains usually grown for one year or less	Reduces erosion. Cover crops remove excess nitrogen and may add desirable organic (versus soluble) nutrients. May slightly decrease surface water temperature.
Nutrient management plans	Plans for determining the amount of nutrients required to achieve desired yields, improve the timing of nutrient application, and increase nutrient use efficiency. May include measures for use and disposal of animal waste.	Minimizes leaching of nutrients from root zone. May reduce amount of nutrients lost with surface runoff.
Timber harvesting plans	Operation and management plans for on-going forestry activities. Should be developed in conjunction with the Soil Conservation Service.	Minimizes sedimentation and erosion from timber harvesting. Reduces the transport of chemicals from fertilizers, pesticides, and insecticides to surface and ground water supplies.

TABLE 8b.
BEST MANAGEMENT PRACTICES FOR DEVELOPMENT AREAS

Measure	Description	Advantages
Extended Detention Facilities	Facilities which temporarily detain a portion of the runoff after a storm event. Facilities normally dry between storm events.	Removes particulate pollutants such as sediment, phosphorus, and organic carbon from the runoff prior to discharge to a stream.
Wet Ponds	Ponds containing permanent pool of water.	Removes particulate and soluble pollutants in storm water runoff.
Stormwater Wetlands	Constructed wetlands designed to provide water quality treatment for stormwater runoff through filtration and vegetative uptake.	Removes particulate and soluble pollutants in storm water runoff. Also provides wetland habitat.
Infiltration trenches	Underground stone trenches for treatment of stormwater runoff. Runoff is directed into the trench, and slowly exfiltrates from the trench into the water table.	Removes particulate and soluble pollutants in storm water runoff.
Sand Filters	Similar to infiltration infiltration trenches. Self-contained beds of sand and adsorptive media such as peat. Pollutants in stormwater runoff are removed as the runoff flows through the filter.	Removes particulate and soluble pollutants in storm water runoff. +
Grassed Swales	Vegetated, engineered channel which removes pollutants in stormwater runoff through filtration through grass and infiltration through soil.	Removes particulate pollutants in storm water runoff.

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VI. APPENDIX

GREENHORNE & O'MARA, INC.
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WATER RESOURCES ADMINISTRATION
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MARYLAND STATE PLANS GRID COORDINATE SYSTEM 1983

FIGURE A1
BIG ANNEMESSEX RIVER WATERSHED
NONTIDAL WETLANDS MANAGEMENT PLAN
DATE OF PHOTOGRAPHY 04/17/88
YEAR OF MAP PRODUCTION 1993

TOP VALUED WETLANDS
HIGH VALUED WETLANDS
MIDDLE VALUED WETLANDS
LOW VALUED WETLANDS
WET FARM FIELDS
POTENTIAL MITIGATION SITES
CONCENTRATED FUTURE DEVELOPEMENT
WETLAND BOUNDARY

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FIGURE A2
BIG ANNEMESSEX RIVER WATERSHED
NONTIDAL WETLANDS MANAGEMENT PLAN
DATE OF PHOTOGRAPHY 04/17/88
YEAR OF MAP PRODUCTION 1993

TOP VALUED WETLANDS
HIGH VALUED WETLANDS
MIDDLE VALUED WETLANDS
LOW VALUED WETLANDS
WET FARM FIELDS
POTENTIAL MITIGATION SITES
CONCENTRATED FUTURE DEVELOPEMEN'
WETLAND BOUNDARY

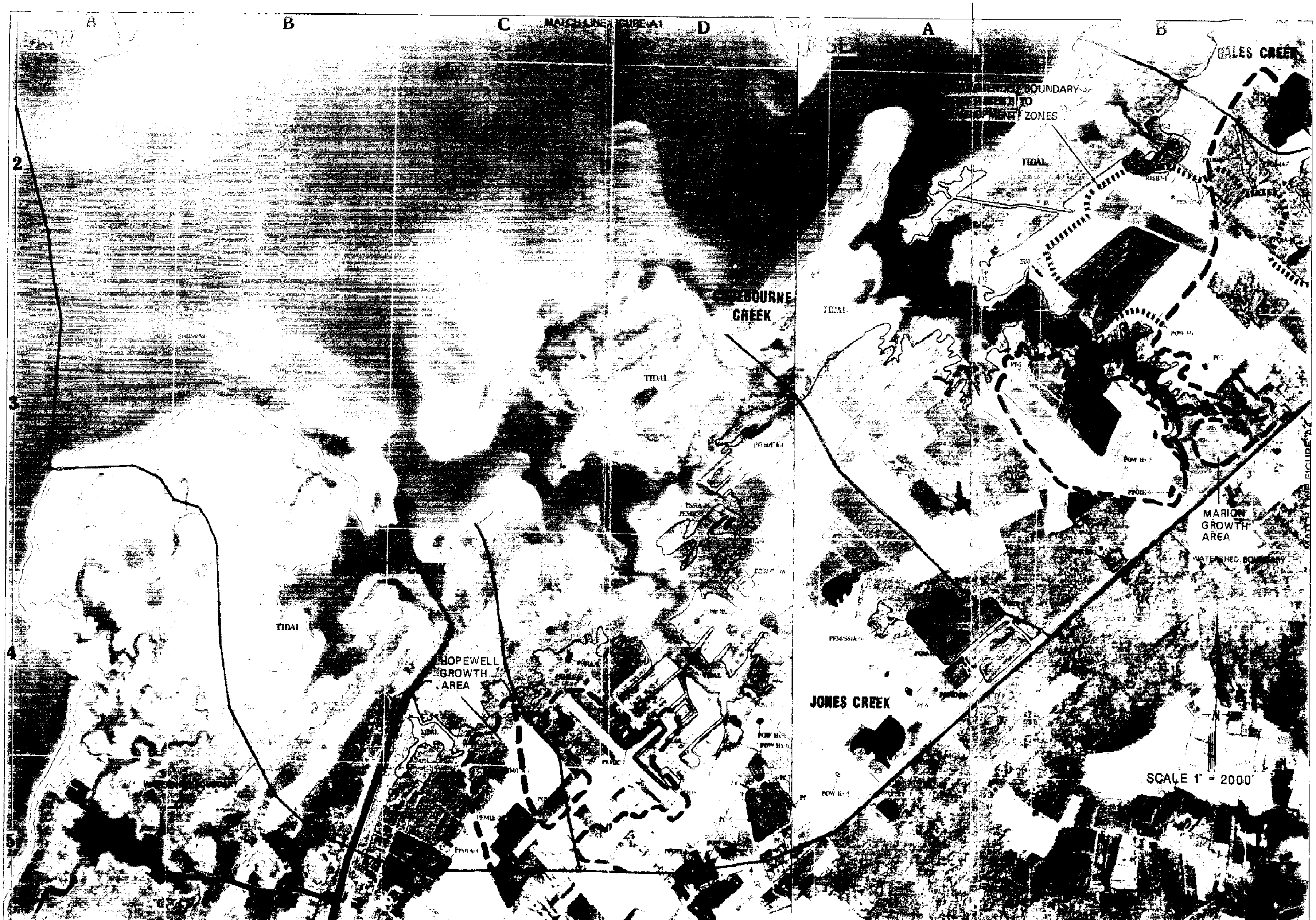

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FIGURE A3
BIG ANNEMESSEX RIVER WATERSHED
NONTIDAL WETLANDS MANAGEMENT PLAN
DATE OF PHOTOGRAPHY 04/17/88
YEAR OF MAP PRODUCTION 1993

- TOP VALUED WETLANDS
- HIGH VALUED WETLANDS
- MIDDLE VALUED WETLANDS
- LOW VALUED WETLANDS
- WET FARM FIELDS
- POTENTIAL MITIGATION SITES
- CONCENTRATED FUTURE DEVELOPEMENT
- WETLAND BOUNDARY

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FIGURE A4
BIG ANNEMESSEX RIVER WATERSHED
NONTIDAL WETLANDS MANAGEMENT PLAN
DATE OF PHOTOGRAPHY 04/17/88
YEAR OF MAP PRODUCTION 1993

- TOP VALUED WETLANDS
- HIGH VALUED WETLANDS
- MIDDLE VALUED WETLANDS
- LOW VALUED WETLANDS
- WET FARM FIELDS
- POTENTIAL MITIGATION SITES
- CONCENTRATED FUTURE DEVELOPEMEN
- WETLAND BOUNDARY

APPENDIX A-5

Results of electrofishing at Marumsco Creek

Species	Month-Day									No. of
	3-4*	3-4	3-11	3-22	3-30	4-11	4-20	4-27	5-2	Occurrences
Anguilla rostrata		X	X	X		X	X		X	6
Umbra pygmaea		X			X	X	X		X	5
Esox americanus		X		X		X		X	X	5
Notemigonus crysoleucas				X	X	X	X	X	X	6
Erimyzon oblongus			X		X	X	X		X	5
Aphredoderus sayanus		X		X		X				3
Fundulus diaphanus	X	X								2
Fundulus heteroclitus	X									1
Lepomis gibbosus	X	X	X	X	X	X	X	X	X	9
Lepomis macrochirus	X	X	X		X	X	X	X	X	8
Pomoxis nigromaculatus	X									1
Total No Species (12)	5	7	4	5	5	8	6	4	7	

Source: Jesien, Roman, et al. Anadromous Fish Survey of Somerset County Streams: Final Report. December 31, 1990. Study submitted to Somerset County Dept. Technical & Community Services

APPENDIX B

BIG ANNEMESSEX WETLANDS
WATERSHED MANAGEMENT PLAN UPDATE
OCTOBER 15, 1993

The Citizen Task Force met on October 5, 1993 to hear a presentation on the wetlands evaluation element of the plan and to discuss the direction the plan may take and attendant issues. Some sixteen participants listened to an agenda which included:

1) State perspectives - an explanation of State interest in Watershed Management Plans and non-tidal wetlands permitting and the certification process by Denise Clearwater of DNR.

2) Results of Wetlands Evaluation element of the plan by Ted Hogan, Greenhorne & O'Mara's Department head for Wetland Services and Pieter de Jong, Senior environmental planner for G & O.

3) Review of issues previously raised at the April 27, 1993 meeting.

4) Discussion other issues needing resolution as the consultants continue work on the plan. The role of cultural and historical elements in the plan was discussed in reference to federal requirements for the protection of cultural resources.

The question had been raised previously as to differences between upland function and non-tidal wetland, particularly in a low lying area. The consultant and Ms. Clearwater commented that most of the non-tidal wetlands evaluated were depressions lower than surrounding areas and that although other areas may have similar functions to wetlands, non-tidal wetlands perform these functions to a higher degree, providing more habitat and are more likely to host endangered species.

No additional water quality monitoring is envisioned as a part of this plan. However, as the emphasis on Bay tributaries increases, we would hope more monitoring would be performed. At this point, water quality on the Big Annemessex appears to be good.

The question of on-site septic impact versus that of sewer lines and more dense development cannot be resolved easily. A cumulative impact analysis could possibly address this problem. However, sewer and water lines are limited to the Fairmount area in this watershed and the most frequent use of land is agriculture or forestry.

Several aspects of mitigation were discussed. Prior converted land is no longer considered non-tidal wetland and is therefore a prime candidate for mitigation. Enhancement of existing wetlands is not usually considered equal to creation and a higher mitigation ratio is therefore required.

The ability to create a wetland has improved as experience in this field grows. Mitigation is most often successful in areas where the water table is naturally high, so that many sites on the Eastern Shore can easily be used for wetland creation/restoration.

While it is true that function will be lost at an original location if mitigation occurs off-site, as was suggested by a Task Force member, there are other factors to be considered. If the area is designated for growth and development is occurring, any wetland might be degraded at that site. a new location could enhance other goals such as habitat diversity and tributary protection and be offered protection from encroachment.

Finally, there had been concern as to another layer of regulation coming out of this plan. Currently, non-tidal wetlands are already protected under the State non-tidal wetlands law and certification of the plan by DNR would streamline the process of permitting. Locally, it is true that existing regulations and zoning may incorporate recommendations from the plan, however, no separate ordinance has been considered.

Discussion then turned to the issues the consultant felt needed clarification as the cumulative impact and recommendation elements of the plan were developed. This included the prioritizing of goals and the views of the Task Force were solicited in this regard.

Initial Task Force response on the need for wetlands protection ranged from the statement that not much has been impacted in Somerset County, which illustrates that the County has been doing a good job to concern that too often farming techniques do not observe a buffer strip next to ditches and animal waste is not properly managed. The group seemed to agree that high value wetlands should received protection and that wetlands should be protected which show the highest ranking as to function. Also diversity of habitat and wildlife should be a prime motivation for protection of non-tidal wetlands.

Some members felt that wetlands functions which protect the water quality of the Bay were of the highest level of importance. In this regard, drainage ditches area also of concern as they may increase nutrients in tributaries and the Bay. The maintenance of existing ditches and possibly, providing some buffering of ditches was also discussed.

Finally members remarked on the importance of education in protecting the watershed and the Bay. County staff commented on the educational programs they have conducted for the Chesapeake Bay Critical Area Program and promised this would continue in the future.

The Task Force adjourned at this point and viewed the seven overlays and maps which the consultant had prepared at 1" - 600'.

Attached is the Issues list which has been discussed by the Task Force to date.

ISSUES LIST

A. General Issues raised at the April 27, 1993 meeting

1) The role of cultural and historical elements in the watershed plan.

2) Monitoring outside of wetlands to determine how upland areas function as opposed to non-tidal wetlands. That is, how unique is the function of wetlands versus adjoining uplands.

3) Implementation Concerns: what is envisioned and will it result in another layer of regulations?

4) Will there be any provision for water quality monitoring in tributary streams?

5) When considering land use, how do septic tanks on the required larger lots affect non-tidal wetlands/water quality versus sewer lines which allow small lots and more development?

6) Will enhancement of degraded wetlands/prior converted land be considered mitigation?

7) Do mitigation areas function effectively as wetlands? If you mitigate outside the immediate area, how does that make up for the loss of function in the original location?

B. Other issues which need resolution

To write a successful plan, we must prioritize goals and objectives and decide how to implement the plan. In other words, we have the framework following DNR guidelines as to what must be addressed, but now we must "fill in" the elements from a County perspective.

1. This is a wetlands watershed management plan so first consideration should be given to our protection objectives. Should we pursue a "no net loss" policy or protect high value wetlands and minimize impacts to lower value wetlands?

2. Is protection of surface water quality an important watershed management goal? If so, management techniques should include buffering streams and/or ditches and choosing mitigation sites near tidal wetlands and streams to enhance protection. [Note: nutrient attenuation and sediment trapping were in low to moderate range in functional assessments]

3. How important is diversity of habitat? Should diversity of habitat be a wetland preservation or mitigation objective?

4. Should maintaining or improving aquatic resources be an important planning goal?

5. What should be the most important planning objectives?

6. The consultant has been given the task of measuring cumulative impacts on the wetlands of the watershed. Thus far, we have suggested using the possible buildout as derived from the 1991 Comprehensive Plan, with special emphasis on growth areas. Should agricultural and forest harvest impacts also be addressed as to potential impact to wetlands?

7. In designing the original concept plan, staff did not see water supply and flood control as important issues in the watershed. Functional assessment of the wetlands in the Big Annemessex region seem to bear this out. Does the Task Force agree with this decision?

8. What is the Task Force's perspective on regulatory controls, voluntary controls or economic incentives to achieve the objectives we have identified? How could this be best implemented?

C. Any additional issues?